

TENDER DOCUMENT

*TENDER DOCUMENT FOR STRENGTHENING AND UP-GRADATION
OF LABS OF ENVIRONMENTAL ENGINEERING*

PAK RUPEES / CNF BASIS

TENDER NO. SAUG/ENV/2014



**STRENGTHENING AND UP-GRADATION OF
UNIVERSITY OF ENGINEERING & TECHNOLOGY
AND ITS SUB-CAMPUS**
UNIVERSITY OF ENGINEERING AND TECHNOLOGY TAXILA
Tel: 051 9047633 Fax: 051 9047797



**UNIVERSITY OF ENGINEERING AND TECHNOLOGY TAXILA
(STRENGTHENING AND UP-GRADATION OF UNIVERSITY OF
ENGINEERING & TECHNOLOGY AND ITS SUB-CAMPUS)**

Phone: 92-51-9047633 Fax: 92-51-9047797

**TENDER DOCUMENT FOR STRENGTHENING AND UP-GRADATION OF LABS OF
ENVIRONMENTAL ENGINEERING ON CNF / PAK RUPEES**

Part (1): Terms and Conditions

1. Please follow the given terms;
 - a. The firm / bidder shall clearly provide the proof of Registration for GST / NTN on their printed letterheads.
 - b. Tender No., date & timing of opening should be clearly mentioned on the top of envelopes.
 - c. Submit your offer for each tender in separate envelopes.
 - d. No tender documents will be received after the closing date / time.
 - e. Bids will be submitted on "Single Stage two Envelopes" basis.
 - f. In case of closed/forced holidays, tender opening time/date will be considered as the next working day.
 - g. Price should be quoted with all accessories
 - h. It is the responsibility of the supplier to provide all necessary equipment with the basic unit to run the system.
2. Certificate showing that the firm has not been blacklisted or debarred by any Government Department.
3. Preference will be given to those firms which have their Head Office/Branch Office and/or Technical Support/Maintenance Facilities at Rawalpindi, Islamabad or Wah Cantt.
4. The specifications of the equipment to be supplied are attached (**Part 3 of Tender Document**).
5. The material must be according to specifications.
6. The supplier is bound to replace within 15 days all or any part of the equipment found defective during initial inspection by Project Committee. The supplier shall provide replacement of defective items / parts to the purchaser at UET, Taxila main store. The supplier shall also remove defective parts / item(s) from Main Store UET Taxila without claiming any additional Cost.
7. Offers shall remain valid for 120 days from the date of opening. The bidders shall quote their prices inclusive of all duties / Taxes / Packing / Petrol / Transportation / Installation / Demonstration etc and all other expenses on delivery to consignee at UET Taxila premises.
8. The sealed bids complete in all respect must reach in the office of the undersigned along with earnest money (2%) in shape of **CDR to be attached with technical offer.**

9. The sealed tenders, complete in all respects, must reach the undersigned at the time and date notified in the advertisement. **Late receipts shall not be entertained**, whatsoever the reason may be.
10. The tenders shall be opened in the office of the undersigned at the notified date and time. The bidders or their representatives can be present if they so desire.
11. Only those tenders will be entertained which are absolutely clear / unambiguous and legible. Any unavoidable cutting / overwriting must be signed and initialed.
12. The offered items must be brand new and free from any manufacturing defect.
13. The University reserves the rights to inspect the working facilities and equipment of the supplier at any stage.
14. The items shall be supplied **within 45-days** of issuance of the Supply Orders.
15. A penalty of **0.5%** of the total cost or order can be imposed per day for delay on the part of the bidder up to maximum 20 days.
16. The University has the right to increase or decrease the quantum of work according to available budget. Prices must be inclusive of all freight, taxes and duties (if any).
17. In case of failure in the supply, the Project Purchase Committee will have the right to cancel the supply order and forfeit the earnest money and blacklisting.
18. In case of delay, Project Purchase Committee can provide extension in the date of supply to any bidder(s) provided valid reasons are given.
19. The payment shall be subject to satisfactory inspection report from the concerned evaluation committee and 10% of the total billed amount shall be retained by the University for a Period **Not less than Six Months**, as Security.
20. The bidders shall submit separately Technical and financial proposals for qualifying status.
21. Following documents must be attached with the technical proposal.

i.	Last income tax paid certificate (FBR)	vii.	GST / NTN valid Certificates
ii.	Last GST paid certificate (FBR)	viii.	No black listing on stamp paper
iii.	Client List	ix.	Bank Statement (worth 2 Million)
iv.	Work Experience	x.	Company profile
v.	Relevant Experience	xi.	Letter of appreciation from previous clients
vi.	Detail specification of equipment with literature	xii.	Warranty / Guarantee Letter

22. The winning bidder shall have to sign a prescribed agreement on the Stamp Paper of prescribed value (i.e. 0.25% of the total ordered cost) duly stamped from notary public.
23. Payment will be as per under university rule after receipt of the supply and satisfactory inspection.

24. The Project Purchase Committee shall have the powers to reject, in part or as a whole, any one or all the quotations without assigning any reason thereof as per PPRA rules.
25. The Tender / Relevant documents can also be downloaded from official website www.uettaxila.edu.pk of UET, Taxila or can be obtained from the office addressed below. For further queries regarding tender, bidder(s) are encouraged to contact / visit undersigned in the university working hours. Tender Notice can also be seen on website www.ppra.punjab.gov.pk.
26. Tender submitted without challan form (Tender Fee) & earnest money CDR can be rejected at the time of opening of tender. Earnest money & challan form will be submitted against each tender separately.
27. The procuring agency "may reject all bids or proposals at any time prior to the acceptance of a bid or proposal. The procuring agency shall upon request communicate to any supplier or contractor who submitted a bid or proposal, the grounds for its rejection of all bids or proposals, but is not required to justify those grounds".
28. Tender will be opened in Conference Hall, Admin Block UET Taxila at **12:00 noon on 03.02.2014**.

Prof. Dr. Saeed Ahmad
Project Director (SAUG)
University of Engineering & Technology, Taxila
Email: dr_sahmad@yahoo.com



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PART (2): SCHEDULE OF REQUIREMENTS FOR THE PURCHASE OF LAB EQUIPMENT FOR ENVIRONMENTAL ENGINEERING

The delivery of services and supply will be made in 45 days after issuance of Purchase Order (without penalty) and with the prescribed penalty as per following schedule of requirement:

MODE OF PENALTY	NO OF DAYS	TOTAL DELIVERY PERIOD
Without Penalty	45 days	45 days
With Penalty @ 0.5 % per day on the delayed completion of task	50 days (5 days after 45 days)	50 days (45 + 05)

PRICE SCHEDULE FOR THE EQUIPMENT ON PAK RUPEES BASIS:

Name of Bidder: _____

The Equipment to be completed is tabulated as under:

S. No.	Item (s)	Qty	Unit price (Rs)	GST (Rs) 17%	Total Cost including GST(Rs)	Bid Security (2% of the Total Cost)
1.						
2.						
3.						

PRICE SCHEDULE FOR THE EQUIPMENT ON CNF BASIS:

Name of Bidder: _____

S. No.	Item(s)	Qty	Currency Type	Unit Cost (CNF)	Total Cost	Bid Security (2% of the Total Cost)
1.						
2.						
3.						

Signature of the Bidder: _____ Stamp of Bidder: _____

Note: In case of discrepancy between unit price and total, the unit price shall prevail.

Issued by: Prof. Dr. Saeed Ahmad
Project Director (SAUG)



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Tender Document
Part (3): Specifications

Sr. No.	Nomenclature / Specification	Quantity
1.	Water & Wastewater Sampler Operating Temperature: 32° F to +158°F (0° to +70°C) Materials: Enclosure: Expanded UV protected PVC Bottle: 2.5 gallon Polyethylene Pickup Hose: 15' reinforced PVC 1/4" ID polyethylene flexible tubing section with intake strainer Pump Tubing: Norprene 1/4" ID, 7/16" OD Sample Pump: Flow Rate: 1000 ml per minute at a 4 foot head Type: Peristaltic Maximum Lift: ~20 feet Battery: Rechargeable 5 AH Gel Cell Battery Life: ~1 hour, continuous pumping under load Standby: 3 months while still retaining enough power to run the pump to capacity Start Delay: 16 time settings from 0 to 12 hours Composite Interval: 15 time settings from 5 min. to 12 hours plus an External Trigger mode setting Sample Size: 15 composite sample sizes from 50ml to 2 liters plus a Full Bottle discrete setting (Approximate sizes at 4 foot head) External Trigger Input: 250mS minimum pulse width Switch closure or 4-24VDC Pulse Output: 5VDC one-second pulse 1000ohm output impedance Bottle Switch Input: Switch closure Input Floating switch in bottle Rain and Water Sensors: moisture sensors or switch closure inputs Internal Fuse: 10A Slow-Blow Size of unit: 22x17x9 inch (56x43x23 cm) (HxWxD)	2
2.	Pilot Water Filtration Plant Flow meter: 0...1000 ltr/h Turbidimeter: 0...50NTU Centrifugal pump: max. flow rate 1000ltr/h Solenoid valves, piping, pump made of corrosion Collecting tank capacity 150ltr each and all accessories to make it functional.	1
3.	Portable TSS Apparatus Measuring range 0.001 to 400 g/L Operating Temperature Range 0 to 60 °C And all other accessories	1
4.	Atomic Adsorption Spectrometer (AAS)	1

Sr. No.	Nomenclature / Specification	Quantity
	Wavelength range: 190-900 nm Inflamer: All-metal titanium burner Atomizer: Effective glass atomizer Power source: 220V±22V AC Flame system : Acetylene air burner, Nitrous oxide acetylene flame Safety system: Can automatically cut off the gas when the pressure is not enough, the power is off, flameout and unconformity of the burner. Temperature : up to 3000°C Lamps: mini eight lamps To measure the trace element of sample (Quote all types of trace elements) with all accessories to make it functional Country of Origin: UK / Japan	
5.	Flame Photometer With 5 channels and be able to detect K, Na, Li, Ca, Ba (5 elements). With K, Na, Li, Ca, Ba five filters, which can detect three kinds of elements, show three kinds of element content simultaneous. Standard accessories: air-compressor, PC software or micro-printer. LCD Display, touch panel with numeric keypad. Single point calibration & calibration curve can be saved. RS232 interface, external computer or printer. With a mist separator. Measurement Range K: 0-100ppm; Na: 0-100ppm; Li: 0-100ppm; Ba: 0-3000ppm Sample Rate: 4 ~ 6ml/min Response Time: < 8s Time Stability : Less than 15 seconds (when the sample was taken after the flame) Calibration Methods : Straight line, broken line, secondary fitting with all accessories.	1
6.	TOC Analyzer Measurement Range : TC:0 to 3500 & IC:0 to 3500 Detection Limit : 0.5 µg/L Measuring Time: 2 – 3 Min Sample Injection Automatic Injection Sample Injection volume 350 to 20400 µl variable IC pre-treatment Automatic internal acidification and sparging Automatic dilution Dilution factor 2 to 50 Gas Consumption Approx 3000 L/month (NPOC) (operating conditions: 8 hours/day x 5 days/wk) With PC and Gas Cylinder and all accessories to make it functional.	1
7.	BOD Reactor It should include; <ul style="list-style-type: none"> • Greaseless bottle seals • Larger graphic display screen • Improved stirring • Smaller footprint • Improved procedures with expanded options • Bottle fences to prevent tipping of bottles and provide tubing management during storage • Auto-switching power supply • Improved temperature control With complete accessories.	1
8.	DO meter Display: Dual LCD	1

Sr. No.	Nomenclature / Specification	Quantity
	Range: 0.00 to 20.0 mg/L (ppm) Saturation: 0.0 to 200.0% Temperature: 0.0 to 50.0°C Resolution: DO: 0.01 mg/L Saturation: 0.1% Temperature: 0.1°C Accuracy: DO: + 1.5% full scale Saturation: + 0.5% full scale Temperature: + 0.1°C Salinity Compensation: Range: 0.0 – 50.0 ppt Resolution: 0.1 ppt Barometric Pressure Compensation: Range: 555 – 808 mm Hg Resolution: 1 mm Hg Temperature Compensation: Automatic from 0 – 50°C - Probe: Galvanic with 10 ft. cable - Memory: 16 data-points - Power: Battery on AC Adapter	
9.	Electric Shaker Microprocessors PID control maintaining constant speed with clamps for 1000ml Flask / beaker Wide speed range: 30 to 500 rpm Digital timer with Delayed ON/OFF function: ranging from 1min to 99 hr 59 min. Intuitive, splash-proof, and easy-to-clean control panel with a vivid and colorful vacuum fluorescent display (VFD), touch sensitive buttons, and a dial knob. Automatic adjusted shaking speed when load imbalance or unusual vibration is detected by the sensor with all accessories	1
10.	Oil Content Analyzer Measurement principle: Solvent extraction, NDIR analysis (Infrared spectroscopy) Measurement range: 0mg/l - 200mg/l dynamic ranging Resolution 0 to 99.9 mg/L; 0.1 mg/L , 100 to 200 mg/L; 1 mg/L Repeatability 0 to 9.9 mg/L; ± 0.2 mg/L ± 1 digit 10.0 to 99.9 mg/L; ± 2 mg/L ± 1 digit 100 to 200 mg/L; ± 4 mg/L ± 1 digit Measurement Automated mixing, filtration and measurement Calibration One touch calibration after the calibration standard is introduced to the instrument Display Measured value; 3 digits LCD with backlight Message; Character display LCD with back-light (16×2 characters) Functions Data memory up to 50 data points, Self diagnostics, Stable type display, Interactive operation, Calendar clock Output RS-232C, parallel printer port RS-232C, parallel printer port Ambient Temperature 0 to 60 °C Dimensions 200(W)×315(D)×342(H) mm	1
11.	Digital Electronic Microscope Microscope with 50000X and 5000X resolution power, LCD display.	2
12.	Bench top Plate/colony Count Apparatus	1

Sr. No.	Nomenclature / Specification	Quantity
	Optics magnified 8X, transmission reflection illuminate, Counting scope 0-9999, power; 10W, the size of culture case; 90mm or less.	
13.	Digital Balance Weighing capacity up to 200 kg.	1
14.	Incubator For drying, baking, annealing, conditioning, sterilizing, evaporating, and dehydrating. Factory-tested. Sturdy welded steel construction. Ample insulation. Two nickel-plated shelves adjustable at 12.7 mm (0.5") increments. Thermostatically controlled with damper-controlled, gravity convection air circulation. Red pilot light indicates heater action. Graygreen, hammerloid, baked enamel finish. Three-wire cord and plug standard. Capacity / Volume = 1 m ³	1
15.	Environmental Light Meter For both indoor & outdoor purposes Illumination Accuracy at 23°C ± 5°C (73.4°F ± 5°F), < 75% R.H. Sensor Silicon photodiode and filter Measurement rate 2.5 times per second Range 20, 200, 2000, 20000, 200000 Lux 20, 200, 2000, 20000 Foot candles Accuracy ± 3% (Calibrated to standard incandescent lamp at 2854°K) 6% other visible light sources Angle deviation from cosine Characteristics 30° ± 2% 60° ± 6% 80° ± 25% Cosine Angular corrected per JIS C 1609:1993 and CNS 5119 general A class Resolution 0.01 fc/lux General Specifications Display 3¾ digit liquid crystal display (LCD) with a maximum reading of 1999 Zero Automatic Temperature / Humidity Operating -10°C to 50°C (14°F to 122°F), 0 to 80%RH Storage -10°C to 50°C (14°F to 122°F), 0 to 70%RH Altitude 2000m, indoor operation With all accessories	2
16.	Digital Noise Meter Should meet the measurement requirements of Safety Engineers, Health, Industrial safety offices and quality control in various environments. ■ A and C weightings for checking compliance with safety regulations as well as acoustic analysis ■ Measuring ranges: A Weighting 30 ~130dB C Weighting 35~130dB ■ Frequency range: 31.5Hz~8KHz ■ Display with 0.1dB steps on a 4 digits LCD ■ Slow (1 sec) and fast (125ms) response settings to check peak and average noise levels ■ MAX/MIN recording ■ Data Hold to freeze reading on digital display ■ Accessories supplied: Carrying case, windscreen, user manual and 9V Battery & all accessories	3
17.	Complete Weather Station	1

Sr. No.	Nomenclature / Specification	Quantity
	<p><i>Wind speed and direction sensors</i></p> <p>3-cup anemometer. Reed pulse output. Aluminium body. IP65 rating. Complete with 4-pin IP65 connector for wiring (cable not included). Supplied with test certificate.</p> <p>Wind vane. Output 0-1V. Power supply 12Vdc, 10mA. Hall effect position transducer. Aluminium body. IP65 rating. Complete with 4-pin IP65 connector for wiring (cable not included). Supplied with test certificate.</p> <p>Cable 6x0,5 + shield. External: polyurethane (price per meter)</p> <p>"T" coupling bar for anemometers diam. 50mm, complete with fitting for radiant shield and pyranometer supports</p> <p>Thermohygrometers natural ventilation versio</p> <p>Ambient temperature and Relative humidity probe. Output: Pt100 (temperature) + 0-1V (RH%). Power supply 12 Vdc, cable L.5 m. included. Supplied with Calibration certificate.</p> <p>Natural ventilation radiant shield. Compatibility with DYA046 arm.</p> <p>Barom ter</p> <p>Barometer Meas.Range: 800-1100 hPa. Output: 0-1Vcc. 12Vdc Power supply. Supplied with Calibration Certificate.</p> <p>Rain gauge 324 cmq</p> <p>Aluminium tipping bucket rain gauge. 324 sq.cm inlet area. 0.2mm resolution. Supplied with Calibration Certificate.</p> <p>Cable L= 10 m with connector for analogue output sensors</p> <p>Ground base for rain gauge installation</p> <p>Poles, Ø 5 cm for sensors installation</p> <p>2m meteo pole (Stainless steel AISI304). Ø 5 cm.</p> <p>Base for meteo poles Ø 50 mm fitted on cement plinth</p> <p>Set of n.3 anchoring bolt for pole bases</p> <p>Set of n. 3 pickets L.1 m</p> <p>Set of n.3 tie-rods for meteo poles</p> <p>E-Log dataloggers</p> <p>E-Log Environmental Datalogger. N.12 inputs (n.8 analogue, n.2 impulse, n.2 on-off). N. 6 digital outputs. N. 20 programmable intervention logics. 16 bit A/D converter. 2 Mb memory. 12 Vdc power supply. N. 2 RS232 serial interfaces. GPRS, GSM and Modbus RTU communication protocols. Complete with L.2 m cable and USB/RS232 converter. Removable terminal blocks for wiring. Complete with SW 3DOM for</p>	

Sr. No.	Nomenclature / Specification	Quantity
	<p>programming and data download.</p> <p>IP65 protection box, wall or pole installation for E-Log and accessories (Data sheet MW8012)</p> <p>IP65 box 300x400 mm. Includes 2Ah rechargeable battery and 220VAC/24-13,8 V (50W) power pack.</p> <p>Pole (diam. 50 mm) mounting arm for IP65 protection box 300x400 mm. With complete accessories & Installation of weather station.</p>	
18.	<p>Digital CO Analyzer (for both indoor & outdoor purposes) Temperature : Operating Storage 0° to +50° C -30°C to +60°C</p> <p>Operating Humidity 0-99% relative humidity (non condensing)</p> <p>Measurement Range 0 to 1000 PPM</p> <p>Measurement Resolution 1 PPM for 0-200 PPM; 5 PPM for 500-1000 PPM</p> <p>Accuracy 3% or ±2 PPM</p> <p>Recovery time from max concentration (<1000 PPM) 10 seconds</p> <p>Sensor type Stabilized electrochemical. Gas-specific (CO)</p> <p>Warm up/Self test Period 10 seconds</p> <p>With all accessories</p>	1
19.	<p>Digital CO₂ Analyzer (for both indoor & outdoor purposes)</p> <ul style="list-style-type: none"> • Easy to read LCD digital display • Compact, lightweight and easy installation • Highly reliable non-dispersive infrared detection method • Recorder output signal • Automatic control of ventilation systems • Alarm contact output provided • Diffusion or sample draw versions • Meets ASHRAE 1969 IAQ Standard of 2,000 ppm max PEL • Detection of CO₂ for NFPA 12 Regulations-CO₂ storage tank leaks <p>With all accessories</p>	1
20.	<p>Digital NO_x Analyzer Precision and Accuracy Higher of 1.5 ppb or 2% of reading Data Storage 14,336 lines (10 s avg. = 1.4 days; 5 min avg = 1.4 mo.) Time/Measurement 10 s (Data averaging options: 10 s, 1 min, 5 min, 1 hr) Sample Flow Rate 1 L/min Data Outputs RS-232, LCD, 0-2.5 V Analog, 4-20 mA Optional, Flash Card Optional With all accessories</p>	1
21.	<p>Traffic Volume Counter Measurement with integrated radar detector Collection of single data for 360,000 vehicles:</p> <ul style="list-style-type: none"> - number of vehicles - direction - speed - vehicle classification (e.g. 2 wheelers, cars, vans, trucks, semitrailers) - distance in seconds - date - time <p>Adjustable for approaching traffic, leaving traffic or both directions 6 vehicle classes 10 speed classes data interface RS 232 (optional USB adapter) speed range from 1 mph to 159 mph / 1 km/h to 255 km/h carrying handle With all accessories</p>	1

Sr. No.	Nomenclature / Specification	Quantity
22.	Digital Particulate Analyzer PM10, PM-5 and PM-2.5 Six channels and a particle size range of 0.3 μm to 10 μm <ul style="list-style-type: none"> • Ultra-lightweight and ergonomic design for easy single-hand operation • Ten hours of standard-use battery life to last a full work day • Large 3.5 inch QVGC color display with backlight, intuitive icons, and large font options make for easy navigation and viewing • 10,000 records stored in device for easy access to historical data • Data should be viewed in traditional tabular or trend graph at the user's preference • Configurable display, sample methods, and alarm setting for sample size count (raw count, per cubic feet, cubic meter, or liter) • Data export to USB memory stick or direct connection to PC via USB cable. • Ethernet enabled for accessing data via internet browser (Windows Explorer, Safari, and Firefox) 	1
23.	Air Sampler for PM10, PM-5 and PM-2.5 including filters This Portable, Maintenance-Free, Variable Speed, High Volume, Brushless Blower Air Sampling System for continuous or intermittent sampling with variable flow range. Filters for PM10, PM2.5 & PM 5 measurement.	1
24.	Indoor Air Quality Meter Digital meter for the measurement of indoor air quality.	1
25.	Digital Analyzer for SO_x Range : Any Range from 0-2000PPM SO ₂ Resolution : 1PPM Response Time : 20 – 30%	1
26.	Digital Ozone Analyzer Measurement Principle Titration of NO with Ozone with Detection of Ozone Depletion by UV Absorption at 254 nm Precision and Accuracy Higher of 1.5 ppb or 2% of reading Data Storage 14,336 lines (10 s avg. = 1.4 days; 5 min avg = 1.4 mo.) Time/M Measurement 10 s (Data averaging options: 10 s, 1 min, 5 min, 1 hr) Sample Flow Rate 1 L/min Data Outputs RS-232, LCD, 0-2.5 V Analog, 4-20 mA Optional, Flash Card Optional Power Requirements Typical: 11.4 watt Maximum: 22.3 watt (warmup) Size 13.3 x 8.3 x 5.3 x in 33.7 x 20.0 x 13.3 cm	1
27.	Digital H₂S Analyzer (631-X or Equivalent) Range 0-100 PPM Temperature Range: -20°C to +50°C	1

Issued by: **Prof. Dr. Saeed Ahmad**
Project Director (SAUG)



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Tender Notice

1. The University of Engineering & Technology, Taxila invites bids for purchase of Laboratory Equipment on CIF and Pak rupees basis for Department of Environmental Engineering, Industrial Engineering, Electrical Engineering, Mechanical Engineering and Electronics & Mechatronics Engineering from authorized distributors / sales agents. The details of equipment including specifications are provided in the Tender document(s).
2. The Tender Document(s) can be purchased on Payment of Rs. 5000/- in Habib Bank, Branch UET Taxila on prescribed Challan Form.
3. Tender Document(s) can also be downloaded from official website of UET, Taxila (www.uettaxila.edu.pk) or can be obtained from the office address below. The Bidders may visit the office of Project Director (SAUG) during working hours of University.
4. The Bids (Technical & Financial) on single stage two envelope basis should reach the undersigned not later than **11:00 am on 03.02.2014**. The bids will be opened on same date at 12:00 noon in the presence of bidders.

Prof. Dr. Saeed Ahmad
Project Director (SAUG)
University of Engineering & Technology, Taxila
Phone: (051) 9047633 Fax: (051) 9047797
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23. Payment will be as per under university rule after receipt of the supply and satisfactory inspection.

24. The Project Purchase Committee shall have the powers to reject, in part or as a whole, any one or all the quotations without assigning any reason thereof as per PPRA rules.
25. The Tender / Relevant documents can also be downloaded from official website www.uettaxila.edu.pk of UET, Taxila or can be obtained from the office addressed below. For further queries regarding tender, bidder(s) are encouraged to contact / visit undersigned in the university working hours. Tender Notice can also be seen on website www.ppra.punjab.gov.pk.
26. Tender submitted without challan form (Tender Fee) & earnest money CDR can be rejected at the time of opening of tender. Earnest money & challan form will be submitted against each tender separately.
27. The procuring agency "may reject all bids or proposals at any time prior to the acceptance of a bid or proposal. The procuring agency shall upon request communicate to any supplier or contractor who submitted a bid or proposal, the grounds for its rejection of all bids or proposals, but is not required to justify those grounds".
28. Tender will be opened in Conference Hall, Admin Block UET Taxila at **12:00 noon on 03.02.2014**.

Prof. Dr. Saeed Ahmad
Project Director (SAUG)
University of Engineering & Technology, Taxila
Email: dr_sahmad@yahoo.com



UNIVERSITY OF ENGINEERING AND TECHNOLOGY TAXILA
(STRENGTHENING AND UP-GRADATION OF UNIVERSITY OF
ENGINEERING & TECHNOLOGY AND ITS SUB-CAMPUS)
Phone: 92-51-9047633 Fax: 92-51-9047797

TENDER NO. SAUG/I.E./2014

PART (2): SCHEDULE OF REQUIREMENTS FOR THE PURCHASE OF LAB EQUIPMENT FOR INDUSTRIAL ENGINEERING

The delivery of services and supply will be made in 45 days after issuance of Purchase Order (without penalty) and with the prescribed penalty as per following schedule of requirement:

MODE OF PENALTY	NO OF DAYS	TOTAL DELIVERY PERIOD
Without Penalty	45 days	45 days
With Penalty @ 0.5 % per day on the delayed completion of task	50 days (5 days after 45 days)	50 days (45 + 05)

PRICE SCHEDULE FOR THE EQUIPMENT ON PAK RUPEES BASIS:

Name of Bidder: _____

The Equipment to be completed is tabulated as under:

S. No.	Item (s)	Qty	Unit price (Rs)	GST (Rs) 17%	Total Cost including GST(Rs)	Bid Security (2% of the Total Cost)
1.						
2.						
3.						

PRICE SCHEDULE FOR THE EQUIPMENT ON CNF BASIS:

Name of Bidder: _____

S. No.	Item(s)	Qty	Currency Type	Unit Cost (CNF)	Total Cost	Bid Security (2% of the Total Cost)
1.						
2.						
3.						

Signature of the Bidder: _____ Stamp of Bidder: _____

Note: In case of discrepancy between unit price and total, the unit price shall prevail.

Issued by: Prof. Dr. Saeed Ahmad
Project Director (SAUG)



UNIVERSITY OF ENGINEERING AND TECHNOLOGY TAXILA
(STRENGTHENING AND UP-GRADATION OF UNIVERSITY OF
ENGINEERING & TECHNOLOGY AND ITS SUB-CAMPUS)

Phone: 92-51-9047633 Fax: 92-51-9047797

Tender Document
Part (3): Specifications

Sr. No.	Equipment Description	Qty (Sets)
1	Process control work benches equipped with PC , PLC, DC power supply sensor, switched and motors, process control interfaces, a barcode scanning system, instrumentation software pneumatic system with cylinders and electronically controlled valves, and a microprocessor board supported with networked programmable controller (PLC'S) with demo process models, graphical control panels and a human machine interface station (PC)	1
2	Temperature, Pressure, Level Controller	1
3	4-Channel data acquisition and analysis instruments with built in digital filters	1
4	Microprocessor Trainers	2
5	Microcontroller Trainers	2
6	PLC Trainers	2
7	Electromagnetic Vibration Generation and Measurement System	1
8	Occupational Activity Simulators Ergo Master Plus Shipping and handling cost	1
9	Anthropometric Measuring Systems (Detail of Parts)	-
i.	Harpenden Anthropometry	1
ii.	Bicondylar Caliper	1
iii.	Abdominal Caliper	1
iv.	Holtain Skinfold Caliper	1
v.	Harpenden Stadiometer	1
vi.	Sitting Height Table	1
vii.	Infantometer	1
viii.	Adult Measuring Table	1
ix.	Harpenden Neonatometer	1
10	Ergo Tread Mills with accessories	1

Sr. No.	Equipment Description	Qty (Sets)
11	Spectra Spot meter	1
12	Surface texture measuring and recording instrument	1
13	Mititoyo Toolmakers Microscope	1
14	Laser interferometer System for machine tool calibration and accuracy assessment	1
15	Telescopic Ballbar for machine tool calibration and accuracy assessment	1
16	Optical position measurement system	1

*Detailed Specifications are attached as **Annex (A)**.*

SPECIFICATIONS

Sr. No.	Equipment Description	Qty (Sets)
1	Process control work benches equipped with PC , PLC, DC power supply sensor, switched and motors, process control interfaces, a barcode scanning system, instrumentation software pneumatic system with cylinders and electronically controlled valves, and a microprocessor board supported with networked programmable controller (PLC'S) with demo process models, graphical control panels and a human machine interface station (PC) OR EQUIVALENT / HIGHER SPECS	1

Instrumentation and Process Control Training System

The Process Workstation is the hub of the different processes to be investigated by the students. It consists of a double-sided mobile workstation equipped with two 60-liter (16-gal) tanks, up to four centrifugal pumps, a Rotameter, a Drip Tray (Front), an Instrumentation Mounting Pipe, Ball Valves, and Process Supports. Up to two groups of students can work at the same time on Pressure/Flow/Level experiments, one group on each side of the Process Workstation. This can be done if the Pressure/Flow/Level option is selected and if the Second Team Add-On.

The Instrumentation Workstation is designed to house the Electrical Unit and the Pneumatic Unit as well as other electrical equipment such as the variable speed drives. Devices such as controllers, PLCs, Color Paperless Recorder, and Touch Screen Graphic Terminals must be installed on the Instrumentation Workstation. The workstation aims to recreate the widespread industrial practice of separating the process environment from the instruments and controllers and it limits the risk of exposing such equipment to contact with water.

Note: Training is compulsory for this equipment. Please quote with training.

Sr. No.	Equipment Description	Qty (Sets)
2	Temperature, Pressure, Level Controller	1

1. Temperature Process Control

Features

- Temperature monitored in primary & secondary circuits, flow also monitored
- P, PI and PID control with auto-tune facility
- Primary circuit flow controlled by motorized control valve
- Primary circuit heater and pump
- Secondary circuit fan-assisted cooling radiator
- Modern push fittings
- Water used as the process fluid.
- Operates from mains water supply using water pressure regulator

Curriculum Coverage

- Temperature familiarization and calibration
- Interface familiarization and calibration
- Controller familiarization and calibration
- Pulse flow transmitter
- On-Off control
- Study of P, PI and PID control of Temperature and Flow
- Manual flow control
- Temperature process control
- Complex control loops

OR EQUIVALENT / HIGHER SPECS

Note: Training is compulsory for this equipment. Please quote with training.

2. Pressure Process Control

Features

- Safe low pressure operation
- Fully gauged for pressure and flow rate
- Differential and Gauge pressure sensors
- Current controlled (4-20mA) pneumatically operated control valve
- Standard industrial components
- Self-sealing outlets for manometer
- Safety valves fitted as standard
- Air used as the process fluid

Curriculum Coverage

- Pressure safety, familiarization and calibration
- I/P converter and Pneumatic control valve operation
- Controller familiarization and calibration
- Automatic control systems
- Serial communication
- Pressure sensor, transmitter and I/P converter- Linearity and Hysteresis
- Pneumatic control valve -characteristics at different pressure ranges
- System response and Air receiver
- Principles of Proportioning valve and proportional process control
- Study of P, PI and PID control of Pressure
- Calibration of the differential pressure sensor & transmitter
- Flow control in the Process rig

OR EQUIVALENT / HIGHER SPECS

Note: Training is compulsory for this equipment. Please quote with training.

3. Level/Flow Process Control

Features

- Contains a selection of level and flow sensors & indicators
- Flow controlled by linear motorised control valve
- On/Off and proportional control
- P, PI and full PID control with auto tune facility
- Couples with Temperature Trainer for dual loop control
- Modern push fittings
- Water used as the process fluid
- Comprehensive lab notes and Discovery Software

Curriculum Coverage

- Flow & Level familiarization and calibration
- Interface familiarisation and calibration
- Controller familiarisation and calibration
- Float level transmitter
- Pulse flow transmitter
- On-Off control
- Study of P, PI and PID control of Level and Flow
- Tuning PID controllers
- Advanced process control

OR EQUIVALENT / HIGHER SPECS

Note: Training is compulsory for this equipment. Please quote with training.

Sr. No.	Equipment Description	Qty (Sets)
3	4-Channel data acquisition and analysis instruments with built in digital filters	1

EMS Data Acquisition and Control Interface - LVDAC (9063)

The Lab-Volt Data Acquisition and Control Interface (DACI), Model 9063, is a versatile USB peripheral used for measuring, observing, analyzing, and controlling electrical and mechanical parameters in electric power systems and power electronics circuits. For these purposes, a set of computer-based instruments as well as a variety of control functions are available for the DACI. These instruments and control functions are accessed through the Lab-Volt Data Acquisition and Control for Electromechanical Systems (LVDAC-EMS) software. Together, the DACI and software LVDAC EMS allow training in various areas, such as electric power technology, AC/DC machines, renewable energy, and power electronics, using modern and versatile measuring instruments and control functions. The user guide provided allows students to quickly become familiar with the instruments and control functions available.

OR EQUIVALENT / HIGHER SPECS

Note: Training is compulsory for this equipment. Please quote with training.

Sr. No.	Equipment Description	Qty (Sets)
4	Microprocessor Trainers	2

Microprocessor, 32-Bit

The objective of the 32-Bit Microprocessor Circuit Board and Course is to build on knowledge gained in Digital Logic Fundamentals to provide comprehensive, hands-on instruction in the principles and applications of 32-bit microprocessor systems.

The circuit board uses the 80386DX CPU to demonstrate microprocessor architecture, read and write cycles, memory functions, I/O concepts, and communication with analog systems using A-to-D and D-to-A converters or serial or parallel protocols.

OR EQUIVALENT / HIGHER SPECS

Sr. No.	Equipment Description	Qty (Sets)
5	Microcontroller Trainers	2

Microcontroller System Development

The FACET Microcontroller System Development course provides comprehensive, hands-on instruction in the terminology, principles, and applications of microcontroller programming.

Students learn basic programming using FlowCode™ and microcontroller hardware.

OR EQUIVALENT / HIGHER SPECS

Sr. No.	Equipment Description	Qty (Sets)
6	PLC Trainers	2

This equipment will include two sets as follows:

Set 1

PLC Trainer (Siemens or Allan Bradley or Equivalent)

Equipped with following items

1. Hydraulics and Pneumatics
2. Electro-Pneumatic System
3. Electro-Mechanical System

Set 2

PLC Trainer (Siemens or Allan Bradley or Equivalent)

Equipped with following items

1. Bottling Application System
2. Wind Turbine Application System
3. Electro-Mechanical System

Note: Training is compulsory for this equipment. Please quote with training.

Sr. No.	Equipment Description	Qty
7	Electromagnetic Vibration Generation and Measurement System	1 Set

It will include the following two components

1. Electromagnetic Vibration Generation System
2. Vibration Measurement System

Descriptions are given below

1. Electromagnetic Vibration Generation System

Electrodynamic vibration provides a testing platform for transportation simulation, mechanical shock, mission profile, and Environmental Stress Screening (ESS). With dynamic factors such as displacement, velocity, acceleration, and force, electrodynamic vibration accurately simulates a wide range of conditions that can help improve the quality and reliability of many products. As a closed loop vibration control system, electrodynamic shakers can accurately reproduce real world vibrations on electronic, automotive, aerospace, and military products.

Thermotron manufactures all of the elements for a turnkey Vibration Test System including the shaker, amplifier, and control system, as well as sliptables, head expanders, and fixturing.

Thermotron's DSX-Series Shakers perform random, sine-to-shock, sine-on-random, and random-on-random tests. The DSX-Series is available in five different capacities listed below.

I. DSX-Series Models

Model Number	Force Rating (Lbf/kN)	Avail. Armature Sizes	Max. Velocity (ips/mps)	Shock*	Amplifier (KVA)	Displacement (in/mm)
DSX-2250	2,250 / 10.0	12 in / 30.5 cm	90 / 2.28	Up to 200g	15 KVA	2.5 / 63
DSX-4000	4,000 / 17.8	16, 24 in / 40.6, 61 cm	70 / 1.78	Up to 130g	15 KVA	2.5-3 / 63-75
DSX-6650	6,650 / 29.6	16, 24 in / 40.6, 61 cm	90 / 2.28	Up to 200g	30 KVA	2.5-3 / 63-75
DSX-8000	8,000 / 35.6	16, 24 in / 40.6, 61 cm	100 / 2.54	Up to 200g	45-60 KVA	2.5-3 / 63-75
DSX-12000	12,000 / 53.4	16, 24 in / 40.6, 61 cm	90 / 2.29	Up to 200g	60 KVA	2.5-3 / 63-75

**Dependent on pulse definition or payload*

OR EQUIVALENT / HIGHER SPECS

2. Vibration Measurement System

Equipment: VibraScout USB DC Triaxial Vibration Measurement System

The VibraScout Vibration Measurement System consists of a USB triaxial DC response accelerometer, 15-foot 4-pin to USB cable assembly, VibraScout Data Acquisition Software, and VibraScout Windows compatible Post Processor software on CD (no license required).

The accelerometer model features power from a PC bus, and as a result no additional external power supply is required. The software package supplied with each system allows for real time, three directional acceleration acquisition (including Static Inclination) along with real-time temperature monitoring. The standard USB protocol handles all the sensor communications with the PC and provides the following information: storage of acceleration and temperature data; real-time scrolling plots of acceleration data with display of min, max and mean; real-time logging of data to delimited file for importing into Excel; both auto and smart triggering modes; digital filters to improve signal/noise ratio; real-time data compression to Fast Fourier Transform (FFT); and many more.

Offered with a 16g range, the variable capacitance (VC) accelerometer combines an integrated VC chip in a hermetically sealed titanium housing weighing 17 grams, and is offered with a low-end frequency response down to DC (0 Hz) and an upper frequency range of 1,100 Hz. Units are rugged to 10,000g shock and operate from +3.8 to +6.0 VDC power.

The VibraScout Post Processor software is designed to provide a user with the tools to apply non-linear interpolation to resample raw data that is recorded with VibraScout software at higher frequencies improve signal resolution. Data is valid only up to 1.1 kHz after applying the post processing. This mathematical interpolation is performed using the Whittaker-Shannon interpolation technique to reproduce the recorded real signals with proper amplitude.

Features of the VibraScout Post Processor software include: plot recorded data from the software; zoom and select a specific timeframe of recorded data for post processing; reproduce interpolated oversampled data to provide better resolution of vibration signals; multiple file types to export to including ASCII, time history .JPG files, TDMS binary files of time history data readable in Microsoft Excel, PSD and FFT plots in Joint Photographic file format; and display of recorded average temperature.

The VibraScout USB Vibration Measurement System was designed for a variety of low-to-medium frequency vibration applications where portability is critical including quick, easy in-field data collection; Noise, Vibration and Harshness (NVH); static angular measurements; ride quality; vibration measurement and diagnosis of rotating machinery; and simplified field data testing.

OR EQUIVALENT / HIGHER SPECS

Note: Training is compulsory for this equipment. Please quote with training.

Sr. No.	Equipment Description	Qty
8	Occupational Activity Simulators Ergo Master Plus Shipping and handling cost	1

PrimusRS - The Ultimate Physical Therapy Equipment.

The BTE PrimusRS is the most versatile and functional smart physical therapy equipment for multi-joint testing, orthopedic rehab, neuromuscular reeducation, and advanced musculoskeletal athletic training of the upper & lower extremities and the core. Evaluate, rehab, and track progress with Isotonic, Isometric, Isokinetic, & CPM resistance modes. PrimusRS physical therapy equipment is the premier choice for evidence-based physiotherapy, physical therapy, occupational therapy, and sports medicine. The BTE PrimusRS is also used by elite athletic trainers and strength coaches for objective, data-driven testing and training of athletes.

OR EQUIVALENT / HIGHER SPECS

Note: Training is compulsory for this equipment. Please quote with training.

Sr. No.	Equipment Description	Qty
9	Anthropometric Measuring Systems (Detail of Parts)	
i.	Harpenden Anthropometry	1
ii.	Bicondylar Caliper	1
iii.	Abdominal Caliper	1
iv.	Holtain Skinfold Caliper	1
v.	Harpenden Stadiometer	1
vi.	Sitting Height Table	1
vii.	Infantometer	1
viii.	Adult Measuring Table	1
ix.	Harpenden Neonatometer	1

Anthropometric Measuring Systems

Anthropometric Measuring Systems include the following parts

i. Harpenden Anthropometer

Harpenden anthropometer gives a direct reading, to the nearest millimetre, over a range of 50 mm to 570 mm (See Figure). It is constructed mainly of light alloy. Its sliding member operates via miniature ball-bearing rollers in order to ensure a movement which is free yet without cross-play.

It would also include a carrying case, complete with straight and recurved branches, a spare counter and beam extensions for the measuring of heights of up to two metres. Weight in case: 2.8 kg approx.

OR EQUIVALENT / HIGHER SPECS

ii. Bicondylar Caliper

Measuring range: 0mm to 140mm

OR EQUIVALENT / HIGHER SPECS

iii. Abdominal Caliper

This caliper makes a direct reading of the distance between the subject's back and the front of the subject's abdomen.

The inbuilt spirit level (which ensures a vertical measurement is taken) helps to give estimates of intra observer precision which produced a mean of absolute deviation of 0.4cm, coefficient of variation of 2.5% and an intraclass correlation coefficient of 95.8

OR EQUIVALENT / HIGHER SPECS

Holtain Skinfold caliper

Holtain Skinfold caliper has been designed for the accurate measurement of sub-cutaneous tissue, and it incorporates the recommended principles for standard usage in such measurements.

DETAILS

Measuring range: 0 mm to 48 mm.

Pressure between Anvils (constant): 10 gms/sq. mm.

Nett weight: 0.4 kg

Dial Graduation: 0.2 mm.

OR EQUIVALENT / HIGHER SPECS

iv. Harpenden Stadiometer

The main frame of this instrument is rigidly made of light alloy angle and provided with adjustable wall brackets for mounting purposes. The Stadiometer head-block operates via miniature ball-bearing rollers in order to ensure a movement which is free yet without cross-play. The Stadiometer has a high speed Veeder-Root counter

Weight: 12.7 kg approx.

OR EQUIVALENT / HIGHER SPECS

v. Sitting Height Table

The Harpenden Sitting Height Table has ball-bearing mounted, counter-balanced head block, giving accurate and direct readings from 320 mm to 1090 mm. In addition it has a secondary carriage, fitted with an anti-reverse carriage lock, in order to compensate for upper leg variations: and an adjustable foot-rest in order to compensate for lower leg variations.

Specification

This instrument is constructed mainly of light alloy on rigid tubular steel legs fitted with adjustable feet. All metal parts have a silver/grey hammer finish.

Weight: 24kg

OR EQUIVALENT / HIGHER SPECS

vi. Infantometer

The Infantometer counter recording instrument designed for post-neonate growth studies. Its freely moving, ball-bearing mounted, carriage is operated via a constant pressure lever, which automatically locks the carriage at the correct measuring point.

Measuring range: 300 mm to 940 mm

Weight: 6.75kg

OR EQUIVALENT / HIGHER SPECS

vii. Adult Measuring Table

This counter recording instrument has the potential for speedy and error-free direct readings, to the nearest millimetre, over a range of 300 mm to 2100mm. Its sliding member operates via ball-bearing rollers in order to ensure a movement which is free yet without cross-play.

Weight: 29.5kg

OR EQUIVALENT / HIGHER SPECS

viii. Harpenden Neonatometer

The ball-bearing mounted carriage has an extremely free movement and is operated via a constant pressure lever, which automatically locks the carriage at the correct measuring point. This mechanism ensures reproducibility of measurement and effectively eliminates variation due to differing operator techniques.

The Neonatometer will include two lengths: long, for normal neonates and short, which will fit in most incubators, for prematures.

Measuring range: Long, 188 mm to 750 mm. Short, 180 mm to 600 mm

OR EQUIVALENT / HIGHER SPECS

Sr. No.	Equipment Description	Qty
10	Ergo Tread Mills with accessories	1 Set

Tread Mill integrated with Exercise Physiology System:

Note: Tread Mill should be provided with the following equipment

A complete exercise physiology recording and analysis system for monitoring cardiorespiratory and metabolic function. The system records and displays continuous real-time measurements of CO₂ and O₂ concentrations, airflow, temperature of respired air, as well as ECG or EMG.

The system includes the

A. PL3508 PowerLab 8/35, LabChart, Scope, LabChart Pro Modules software, LabTutor MLS400 Software

This is the LabTutor 4 Suite is designed to facilitate the centralized management of students and their LabTutor data. It contains LabTutor Server (Single User License), LabTutor Client, LabAuthor (Single User License). This software is supplied free of charge with ML4818, ML4856 or any PTB purchases. LabTutor Online is optional and purchased separately). LabTutor software is an HTML based teaching software interface which is used with Internet Explorer. Real-time data acquisition display, experimental instructions and student interactive components are available with the supplied LabTutor experiments.

B. FE132 Bio Amp

The FE132 Bio Amp is a single channel, galvanically-isolated device (certified safe for human connection, BF rated). It is a high performance software-controlled differential amplifier with filter settings optimized for the measurement of a wide variety of biopotential signals, including ECG, EEG, EMG and EOG. Supplied with a MLA2340 Shielded Bio Amp Cable and MLA2503 Shielded Lead Wires.

C. ML206 Gas Analyzer

The ML206 Gas Analyzer is a stand-alone instrument for the measurement of CO₂ and O₂ gas concentration. It uses infrared CO₂ and optical O₂ sensors and is able to sample expired gas from a mixing chamber. A flow control knob on the front of the unit provides sampling rates of 35 to 200 mL/min (dependent of tube length and diameter) and is suitable for animal or human research as well as student laboratories. It is supplied with nafion tubing and 10 in-line filters (MLA0110).

D. MLA246 Gas Mixing Chamber

The MLA246 Gas Mixing Chamber provides a capacity of 4.7 L for collecting, mixing and sampling expired respiratory gases. It is suitable for use with the ML206 Gas Analyzer and is included with the Exercise Physiology System. Three 2 mm (0.08") male luer lock connectors allows sampling lines to be connected to the unit and 35 mm (1.4") inlet and exhaust ports are provided. For cleaning instructions see our web site.

E. FE141 Spirometer

The FE141 Spirometer is a precision software-controlled, differential pressure transducer for measuring respiratory flow rates from pneumotach flow heads. Flow heads for use with animals and humans (1 - 1000 L/min) are available for purchase separately

F. MLA240 Exercise Physiology Accessory Kit (includes small-medium face mask kit MLA1029)

The MLA240 kit contains a MLT1000L Respiratory Flow Head (1000L/min), MLA1029 Face Mask Kit, MLA1081 Flow Head Adapter, MLA1013 35 mm ID Tubing Adapter, MLA6024 Desiccant Cartridge, MLA1015 Breathing Tube, 1 mm Silicon Tubing (2), MLA0343 Drying Tube and a MLT415/M Thermistor Temperature Sensor.

G. ML309 Thermistor Pod.

The ML309 Thermistor Pod can be used with 10 kOhm thermistors in the range of 5 to 45 C and includes a 10 Hz, 3-pole LP filter. A DC offset provides the means for differential thermometry with a resolution of 0.001 C. The pod is suitable for use with the MLT409/A Skin Temperature or MLT415/A Nasal Temperature Probes that can be purchased separately. Transducers with 3-pin mini-audio connectors can be used with this unit.

H. MLAEC2 EEG Electro-cap System

The MLAEC2 EEG Electro-cap System 2 includes a large cap , a medium cap, electrode adapter (suits MLA2540 5-Lead Shielded Bio Amp Cable), body harness, quick insert electrodes (two of), ear electrodes (two pairs), disposable sponge disks (100), needle/syringe kits (two of), electro-gel (two x 16 oz), head measuring tape, ivory cleaning liquid and a manual. The system is suitable for use with the ADInstruments ML135 Dual Bio Amp, ML138 Octal Bio Amp or the GT201 16 Channel Bio Amp.

I. FE135 Dual Bio Amp

The FE135 Dual Bio Amp provides two galvanically-isolated channels (certified safe for human connection, CF rated). It is a high performance differential amplifier with filter settings optimized for the measurement of a wide variety of biopotential signals, including ECG, EEG, EMG or EOG, from a single subject. Supplied with a MLA2540 Shielded Bio Amp Cable and MLA2505 Shielded Lead Wires.

J. **MLT415/M Thermistor Temperature Sensor**

OR EQUIVALENT / HIGHER SPECS

Note: Training is compulsory for this equipment. Please quote with training.

<i>Sr. No.</i>	<i>Equipment Description</i>	<i>Qty</i>
11	Spectra Spot meter	1 Set

Spectra CineSpot Spotmeter

Spectra CineSpot Spotmeter is exclusively designed to measure screen brightness and uniformity in theaters, review rooms. CineSpot has received one of the highest awards from the Academy of Motion Picture Arts and Sciences

The economical, compact CineSpot 1° Spotmeter from Spectra Cine has been designed for easy use and for making simple yet accurate screen brightness measurements and other field measurements. The CineSpot features eye-level, magnified, thru-the-lens viewing of the 1° spot area in a large (21° diagonal) rectangular viewing field, with simultaneous display of the meter reading superimposed in the viewing field.

For accuracy, each individually calibrated instrument uses an ultra-stable silicon photodetector, together with computer-selected glass filters to Readability of the CineSpot extends from 0.5 to 300 foot-lamberts, with excellent resolution in the critical 10 to 30 foot-lambert region.

Measurement functions

- Screen brightness and uniformity
- Contrast ratios
- Stray light and surround brightness

OR EQUIVALENT / HIGHER SPECS

Note: Training is compulsory for this equipment. Please quote with training.

Sr. No.	Equipment Software Description	Qty
12	Surface texture measuring and recording instrument	1 set

Surface texture measuring and recording instrument. For checking surface of roughness of metallic surfaces.

OR EQUIVALENT / HIGHER SPECS

Note: Training is compulsory for this equipment. Please quote with training.

Sr. No.	Equipment Software Description	Qty
13	Mititoyo Toolmakers Microscope	1 set

Set will include following

1. Microscope (Model: BX51M)
2. OLYMPUS Stream Software

1. Microscope

Olympus BXiS microscopes are developed based on cutting edge of optical and imaging technologies and fit for any material applications.

2. OLYMPUS Stream Software

As the users progress from image capture to report creation, the tool windows are always displayed at every stage. The users can quickly and easily access control parameters.

OR EQUIVALENT / HIGHER SPECS

Note: Training is compulsory for this equipment. Please quote with training.

Sr. No.	Equipment Software Description	Qty
14	Laser interferometer System for machine tool calibration and accuracy assessment	1 set

Laser interferometer System will consist the following

1. XL-80 laser system with universal shutter and XC-80 compensator
2. Tripod and Stage
3. LaserXL™ software
4. QuickViewXL™ software and
5. XR20-W Rotary Table.

1. XL-80 laser system with universal shutter and XC-80 compensator

XL-80 laser

The XL-80 laser produces an extremely stable laser beam with a wavelength that is traceable back to national and international standards.

The laser frequency stability is specified as ± 0.05 ppm over 1 year and ± 0.02 ppm over 1 hour. Linear measurement accuracy is an assured ± 0.5 ppm over the whole environmental range i.e. from 0 °C - 40 °C (32 °F - 104 °F) and 650 mbar - 1150 mbar. Readings are taken at 50 kHz, with a maximum linear measurement speed of 4 m/s and a linear resolution of 1 nm; even at maximum speed.

With integrated USB there is no requirement for a separate laser-to-PC interface. The laser also features an auxiliary analogue signal output as standard, with quadrature output a factory option. The same socket also accepts a trigger signal input for data capture synchronization.

LED status lights, indicating laser status and signal strength, provide back-up to the software's 'on-screen' indicators. Together with a switchable long range mode (40 m - 80 m) and a warm-up time of less than 6 minutes, these features make the XL-80 quick and easy to use. An external, switch mode power supply ensures 90 V - 264 V flexibility in input voltage.

The XC-80 compensator

The XC-80 compensator is a key factor in XL system's measurement accuracy. Featuring 'intelligent sensors' that process the readings at source, the compensator very accurately measures air temperature, air pressure and relative humidity.

It then modifies the nominal value of the laser wavelength to give a true value, used in displacement calculations, which virtually eliminates any measurement errors resulting from these variations. This can be done automatically, every 7 seconds, as indicated by LED status lights on the XC-80 unit.

Like the XL-80 laser, the compensator is directly connected to PC via a USB port which, for the XC unit, also supplies power (no separate power supply is required).

2. Tripod and Stage

Tripod and stage are used to adjust the laser's position relative to the desired measurement axis.

The XL tripod stage allows for precise angular rotation and translation of the XL-80 and is designed to be left attached to the laser unit for easy storage and quick set-up.

A 'quick fit/release' mechanism enables rapid and secure fixing to the tripod. For those applications where tripod mounting is not convenient, e.g. for mounting directly on a machine tool table, the stage and laser can also be mounted on most standard magnetic bases, using an optional adapter with M8 thread.

3. Laser software

Laser software includes modules for linear, angular, rotary axis, flatness, straightness and squareness measurements, as well as dynamic measurement capability. Standard report options conform to many international machine performance checking standards, such as ISO,

ASME, VDI, JIS and GB, and include a comprehensive Renishaw analysis.

The standard analysis software includes an option to generate compensation values for use in the CNC machine's controller, significantly improving the machine's positioning accuracy. The 'stand alone' linear error compensation packages include additional capability to read and write to the machine's controller, enabling existing error compensation parameters to be read and new ones to be uploaded.

4. QuickView software and

- Live data display in an oscilloscope style format
- Data capture rate of 50 kHz
- Supports measurement with linear, angular or straightness measurement optics
- Three modes of data capture: free running, single shot trigger and multi-shot trigger
- Distance, velocity and acceleration display modes
- Selectable filters of 1, 2, 5, 10, 20, 50 and 100 ms response
- Cursors for measurement of amplitude, time and frequency
- Manual scale, pan and zoom functions allowing 'close up' analysis of selected data
- Auto scale option

Captured data can easily be loaded into supporting applications such as MathCAD, Mathematica and Excel for further analysis using CSV file format. It can also be loaded into Renishaw's LaserXL™ software allowing FFT analysis.

5. XR20-W Rotary Table.

The XR20-W provides for automatic data collection when used with a Renishaw laser and angular optics.

Measurement Specifications

Linear

Specification	Metric	Imperial
Linear measurement range	0 m – 80 m	0 in – 3200 in
Measurement accuracy (with XC-80 compensator)	±0.5 ppm (parts per million)	
Resolution	0.001 µm	0.1 µin
For measurements over 40 m it is recommended to use the long range linear accessory kit. Performance specifications for linear (above) and other measurement modes are quoted to 95% confidence level (k = 2), and are valid across the full environmental operating range.		

Angular

Specification	Metric	Imperial
Axial range	0 m - 15 m	0 in - 590 in
Angular measurement range	±175 mm/m	±10°
Angular accuracy	±0.2%* ±0.5 ±0.1M µm/m	±0.2%* ±0.1 ±0.007F arc sec
Resolution	0.1 µm/m	0.01 arc sec
Where M = measurement distance in metres; F = measurement distance in feet % = percentage of calculated angle * With high accuracy angular optics (± 0.6% with standard optics)		

Rotary

Specification	Metric	Imperial
Angular target range	up to 25 revolutions	
Measurement accuracy (zero at 0°)	±5 µm/m	±1 arc sec
Max axis (<5° axis rotation)	Unlimited	
rotation speed (>5° axis rotation)	10 rpm	
Bluetooth range	Typically 5 - 10 metres	
Orientation	Any	

Flatness

Specification	Metric	Imperial
Axial range	0 m - 15 m	0 in - 590 in
Flatness measurement range	±1.5 mm	±0.06 in
Accuracy	±0.6% ±0.02 M ² µm	±0.6% ±0.08 F ² µin
Resolution	0.01 µm	1 µin
Foot spacing	50 mm, 100 mm and 150 mm	2 in, 4 in and 6 in (approx)
Where M = length of the diagonal in metres; F = length of the diagonal in feet; % = percentage of calculated flatness		

Straightness

Specification	Metric	Imperial
Axial range (short range)	0.1 m - 4.0 m	4 in - 160 in
(long range)	1 m - 30 m	40 in - 1200 in
Straightness measurement range	±2.5 mm	±0.1 in
Accuracy (short range)	±0.5% ±0.5 ±0.15 M ² µm	±0.5% ± 20 ±0.5 F ² µin
(long range)‡	±2.5% ±5 ±0.015 M ² µm	±2.5% ±200 ±0.05 F ² µin
Resolution (short range)	0.01 µm	1 µin
(long range)	0.1 µm	10 µin
Where M = measurement distance in metres; F = measurement distance in feet; % = percentage of displayed value ‡ subject to environmental conditions		

OR EQUIVALENT / HIGHER SPECS

Note: Training is compulsory for this equipment. Please quote with training.

Sr. No.	Equipment Software Description	Qty
15	Telescopic Ballbar for machine tool calibration and accuracy assessment	1 set

The set will include the following

1. Ballbar system (Model: QC20-W)
2. Ballbar 20 software

OR EQUIVALENT / HIGHER SPECS

Note: Training is compulsory for this equipment. Please quote with training.

Sr. No.	Equipment Software Description	Qty
16	Optical position measurement system	1 set

The K-Scan MMDx is a walk-around scanning solution combining the digital ModelMaker MMDx laser scanner with the portable K-series optical CMM. K-Scan is ideally suited for on-site 3D digitizing tasks requiring minimum setup and fast results. Operating the scanner with a laser stripe width up to 200mm is easy and efficient. The 6m working range of the optical CMM is more than sufficient to take measurements in and around a full vehicle. The dense point clouds that are acquired can be graphically analyzed in Focus software, or in 3rd party packages.

SpaceProbe

The ergonomic SpaceProbe is used for traditional touch trigger or analog scanning measurements. Automatic tip detection supports a variety of ball and point probes and extensions.

- Robust, lightweight design
- Ergonomic position of trigger buttons to control measurements
- Sound and LED measurement feedback
- Wireless kit available
- Multiple probe tip extensions for cavity measurement
- Analysis in CMM-Manager or 3rd party tactile measurement software

OR EQUIVALENT / HIGHER SPECS

Issued by: (Prof. Dr. Saeed Ahmad)
Project Director (SAUG)



**UNIVERSITY OF ENGINEERING AND TECHNOLOGY TAXILA
(STRENGTHENING AND UP-GRADATION OF UNIVERSITY OF
ENGINEERING & TECHNOLOGY AND ITS SUB-CAMPUS)**

Phone: 92-51-9047633 Fax: 92-51-9047797

Tender Notice

1. The University of Engineering & Technology, Taxila invites bids for purchase of Laboratory Equipment on CNF and Pak rupees basis for Department of Environmental Engineering, Industrial Engineering, Electrical Engineering, Mechanical Engineering and Electronics & Mechatronics Engineering from authorized distributors / sales agents. The details of equipment including specifications are provided in the Tender document(s).
2. The Tender Document(s) can be purchased on Payment of Rs. 5000/- in Habib Bank, Branch UET Taxila on prescribed Challan Form.
3. Tender Document(s) can also be downloaded from official website of UET, Taxila (www.uettaxila.edu.pk) or can be obtained from the office address below. The Bidders may visit the office of Project Director (SAUG) during working hours of University.
4. The Bids (Technical & Financial) on single stage two envelope basis should reach the undersigned not later than **11:00 am on 03.02.2014**. The bids will be opened on same date at 12:00 noon in the presence of bidders.

Prof. Dr. Saeed Ahmad
Project Director (SAUG)
University of Engineering & Technology, Taxila
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Email: dr_sahmad@yahoo.com

TENDER DOCUMENT

*TENDER DOCUMENT FOR STRENGTHENING AND UP-GRADATION
OF LABS OF MECHANICAL ENGINEERING*

PAK RUPEES / CNF BASIS

TENDER NO. SUAG/MECH/2014



**STRENGTHENING AND UP-GRADATION OF
UNIVERSITY OF ENGINEERING & TECHNOLOGY
AND ITS SUB-CAMPUS**

UNIVERSITY OF ENGINEERING AND TECHNOLOGY TAXILA

Tel: 051 9047633 Fax: 051 9047797



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**TENDER DOCUMENT FOR STRENGTHENING AND UP-GRADATION OF LABS OF
MECHANICAL ENGINEERING ON PAK RUPEES / CNF BASIS**

Part (1): Terms and Conditions

1. Please follow the given terms;
 - a. The firm / bidder shall clearly provide the proof of Registration for GST / NTN on their printed letterheads.
 - b. Tender No., date & timing of opening should be clearly mentioned on the top of envelopes.
 - c. Submit your offer for each tender in separate envelopes.
 - d. No tender documents will be received after the closing date / time.
 - e. Bids will be submitted on **"Single Stage two Envelopes"** basis.
 - f. In case of closed/forced holidays, tender opening time/date will be considered as the next working day.
 - g. Price should be quoted with all accessories
 - h. It is the responsibility of the supplier to provide all necessary equipment with the basic unit to run the system.
2. Certificate showing that the firm has not been blacklisted or debarred by any Government Department.
3. Preference will be given to those firms which have their Head Office/Branch Office and/or Technical Support/Maintenance Facilities at Rawalpindi, Islamabad or Wah Cantt.
4. The specifications of the equipment to be supplied are attached (**Part 3 of Tender Document**).
5. The material must be according to specifications.
6. The supplier is bound to replace within 15 days all or any part of the equipment found defective during initial inspection by Project Committee. The supplier shall provide replacement of defective items / parts to the purchaser at UET, Taxila main store. The supplier shall also remove defective parts / item(s) from Main Store UET Taxila without claiming any additional Cost.
7. Offers shall remain valid for 120 days from the date of opening. The bidders shall quote their prices inclusive of all duties / Taxes / Packing / Petrol / Transportation / Installation / Demonstration etc and all other expenses on delivery to consignee at UET Taxila premises.
8. The sealed bids complete in all respect must reach in the office of the undersigned along with earnest money (2%) in shape of **CDR to be attached with technical offer**.

9. The sealed tenders, complete in all respects, must reach the undersigned at the time and date notified in the advertisement. **Late receipts shall not be entertained**, whatsoever the reason may be.
10. The tenders shall be opened in the office of the undersigned at the notified date and time. The bidders or their representatives can be present if they so desire.
11. Only those tenders will be entertained which are absolutely clear / unambiguous and legible. Any unavoidable cutting / overwriting must be signed and initialed.
12. The offered items must be brand new and free from any manufacturing defect.
13. The University reserves the rights to inspect the working facilities and equipment of the supplier at any stage.
14. The items shall be supplied **within 45-days** of issuance of the Supply Orders.
15. A penalty of **0.5%** of the total cost or order can be imposed per day for delay on the part of the bidder up to maximum 20 days.
16. The University has the right to increase or decrease the quantum of work according to available budget. Prices must be inclusive of all freight, taxes and duties (if any).
17. In case of failure in the supply, the Project Purchase Committee will have the right to cancel the supply order and forfeit the earnest money and blacklisting.
18. In case of delay, Project Purchase Committee can provide extension in the date of supply to any bidder(s) provided valid reasons are given.
19. The payment shall be subject to satisfactory inspection report from the concerned evaluation committee and 10% of the total billed amount shall be retained by the University for a Period **Not less than Six Months**, as Security.
20. The bidders shall submit separately Technical and financial proposals for qualifying status.
21. Following documents must be attached with the technical proposal.

i.	Last income tax paid certificate (FBR)	vii.	GST / NTN valid Certificates
ii.	Last GST paid certificate (FBR)	viii.	No black listing on stamp paper
iii.	Client List	ix.	Bank Statement (worth 2 Million)
iv.	Work Experience	x.	Company profile
v.	Relevant Experience	xi.	Letter of appreciation from previous clients
vi.	Detail specification of equipment with literature	xii.	Warranty / Guarantee Letter

22. The winning bidder shall have to sign a prescribed agreement on the Stamp Paper of prescribed value (i.e. 0.25% of the total ordered cost) duly stamped from notary public.
23. Payment will be as per under university rule after receipt of the supply and satisfactory inspection.

24. The Project Purchase Committee shall have the powers to reject, in part or as a whole, any one or all the quotations without assigning any reason thereof as per PPRA rules.
25. The Tender / Relevant documents can also be downloaded from official website www.uettaxila.edu.pk of UET, Taxila or can be obtained from the office addressed below. For further queries regarding tender, bidder(s) are encouraged to contact / visit undersigned in the university working hours. Tender Notice can also be seen on website www.ppra.punjab.gov.pk.
26. Tender submitted without challan form (Tender Fee) & earnest money CDR can be rejected at the time of opening of tender. Earnest money & challan form will be submitted against each tender separately.
27. The procuring agency "may reject all bids or proposals at any time prior to the acceptance of a bid or proposal. The procuring agency shall upon request communicate to any supplier or contractor who submitted a bid or proposal, the grounds for its rejection of all bids or proposals, but is not required to justify those grounds".
28. Tender will be opened in Conference Hall, Admin Block UET Taxila at **12:00 noon on 03.02.2014**.

Prof. Dr. Saeed Ahmad
Project Director (SAUG)
University of Engineering & Technology, Taxila
Email: dr_sahmad@yahoo.com



UNIVERSITY OF ENGINEERING AND TECHNOLOGY TAXILA
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TENDER NO. SUAG/MECH/2014

***PART (2): SCHEDULE OF REQUIREMENTS FOR THE PURCHASE OF LAB EQUIPMENT FOR
MECHANICAL ENGINEERING***

The delivery of services and supply will be made in 45 days after issuance of Purchase Order (without penalty) and with the prescribed penalty as per following schedule of requirement:

MODE OF PENALTY	NO OF DAYS	TOTAL DELIVERY PERIOD
Without Penalty	45 days	45 days
With Penalty @ 0.5 % per day on the delayed completion of task	50 days (5 days after 45 days)	50 days (45 + 05)

PRICE SCHEDULE FOR THE EQUIPMENT ON PAK RUPEES BASIS:

Name of Bidder: _____

The Equipment to be completed is tabulated as under:

S. No.	Item (s)	Qty	Unit price (Rs)	GST (Rs) 17%	Total Cost including GST(Rs)	Bid Security (2% of the Total Cost)
1.						
2.						
3.						

PRICE SCHEDULE FOR THE EQUIPMENT ON CNF BASIS:

Name of Bidder: _____

S. No.	Item(s)	Qty	Currency Type	Unit Cost (CNF)	Total Cost	Bid Security (2% of the Total Cost)
1.						
2.						
3.						

Signature of the Bidder: _____ Stamp of Bidder: _____

Note: In case of discrepancy between unit price and total, the unit price shall prevail.

Issued by: Prof. Dr. Saeed Ahmad
Project Director (SAUG)



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***Tender Document
Part (3): Specifications***

Sr. No	Name of Equipment	Qty	Specifications
1.	Buckling tester	1	Test bars - quantity: 11 - bar length: 350...700mm (max.) - materials: aluminium, copper, brass, steel Load application spindle - force: max. 2000N - stroke: max. 10mm Lateral deflection: max. 20mm Specimen holder bore: d=20mm Measuring ranges - force: 0...2500N, graduations: 50N - deflection: 0...20mm, graduations: 0.01mm Set of weights for transverse load: max. 20N - 3x 5N, 1x 5N (hanger)
2.	Apparatus for investigating Hook's law	1	Dimensions: Approximately 600(L) x 200(W) x 0(H) Net weight: approximately 20Kg Integral deflection scale: 0..... 80mm; 1mm resolution 3 x tension springs supplied 3 x Compression springs supplied Calibrated weights set up to Load hanger OR LxWxH: approx. 360x280x185mm Shaft diameter: D=16mm Scale disc diameter: D=100mm
3.	Shear force and bending moment apparatus	1	Beam - total length: 1000mm - span: 800mm Measuring ranges - bending moment via force gauge and lever arm lever arm: 100mm Force gauge: -100...+100N bending moment: -10...+10Nm - shear force: -50...+50N - steel rule: 1000mm, graduations: 1mm Set of weights - 3x 1N (hangers) - 12x 1N - 9x 5N - max. weight load per hanger: 20N
4.	Extension and compression of spring apparatus	1	• Wall mounted compact unit to test springs up to 200mm long and 38mm diameter. • One spring • Technical manual for student and lecturer. • Set of weights
5.	Eccentrically loaded ties apparatus	1	Wall-mounting apparatus with wall bracket, vertically mounted tie with three load positions, dial indicator on independent support for centre deflection, balance weight and load hanger,

Sr. No	Name of Equipment	Qty	Specifications
			complete with a set of loading weights.
6.	Rubber in shear apparatus	1	Measures the shear deflection of a rubber block 150x75x25mm and allows Bulk Modulus and Poisson`s Ratio to be determined Deflection measured by a dial gauge An Instruction manual for student and lecturer provided Set of weights
7.	Gyroscope apparatus	1	Gyroscope rotational speed: 1000...6000rpm Gyroscope frame rotational speed: 5...63rpm Gyroscope weight: 65g Radius range of the weight: 0...95mm
8.	Hook's coupling apparatus	1	Helical spring short coils: 53 - d=18.3mm - wire diameter: d=1,0mm Helical spring long - coils: 109 - d=18,3mm - wire diameter: d=1,0mm Scale, graduations: 1mm Set of weights - 10x 0,5N - 1x 1N (hanger)
9.	Ackermann steering demonstrator	1	Technical Data King pin spacing: 465mm Steering lock angle: $\pm 50^\circ$, graduations: 1° LxWxH approx. 630x280x50mm
10.	Geared system apparatus	1	3-stage gear with 4 shafts - transmission ratio per stage: $i = 4:1$ - overall transmission ratio: $i = 64:1$ Gear width: 16mm, module 2mm Drive - set of weights: 5...50kg - drop height: max. 0,65m - max. potential energy: 320Nm Measuring range - speed: 0...2.000min-1
11.	Critical speed investigating apparatus	1	Speed range: 300...3000rpm Motor output: 0.25kW Experimental rotor shaft: Dxl 6x500mm, steel Weights: D=80mm, 1kg, steel Min. spacing of weights: 50mm Support: pendulum ball bearing Adjustable bearing spacing: 300...470mm Catch play: 3mm System for Data Acquisition Accessory for Critical Speed Investigation Apparatus.
12.	Cam and follower mechanism apparatus	1	Angle scale - 0...360° - graduations: 1° Dial gauge for displacement - 0...30mm - graduations: 0,01mm
13.	Belt friction apparatus	1	Flat belt - 15x2.2mm, leather/polyamide

Sr. No	Name of Equipment	Qty	Specifications
			V-belt - ISO 4184 - profile: SPZ - 9.7x8.0mm, rubber/fabric Round belt: 3mm, hemp Belt pulley - D=300mm - material: cast iron Dynamometer: 100N \pm 1N, spring balance
14.	Balance of reciprocating masses	1	Engine - number of cylinders: 4 - piston mass: 40g - additional mass: 41g Crank drive - mass of connecting rod: 18g - centre distance of cylinders: 35mm - crank radius: 15mm - length of connecting rod: 70mm Measuring ranges - speed: 100 ... 3.000min ⁻¹ - force: 0...500N
15.	Exhaust gas calorimeter	1	Calorimeter - insulated, stainless steel Finned pipe heat exchanger - heat exchange area on exhaust gas side: 1.169m ² - heat exchange area on water side: 0.164m ² Measuring ranges - exhaust gas temperature: 2x 0...600°C - water temperature: 2x 0...200°C - flow rate: 0...600L/h
16.	Methods of pressure measurement	1	bourdon tube manometer: 0...60mbar bourdon tube manometer: -60...0mbar U-tube manometer: 0...500mmWC inclined tube manometer: 0...500mmWC panel - LxWxH: approx. 750x600x780mm; weight: 12kg calibration device - LxWxH: approx. 400x400x400mm; weight: approx. 25kg
17.	Worm and Wheel Apparatus	1	Worm and Wheel Apparatus. Wall mounted unit with 1,2,3 &4 start worm and worm wheel gear sets, load drum, load cords and two hangers. Along with an instruction manual
18.	Flywheel Apparatus	1	Wall mounted unit to investigate acceleration and inertia. Wall bracket carrying ball bearing mounted shaft with precision machined steel flywheel, load cord and load hanger. Supplied with an instruction manual. Accessories as per order codes.

Sr. No	Name of Equipment	Qty	Specifications
19.	Gyroscope	1	<p>Demonstration and student experiments on the moments generated on a gyroscope</p> <p>Adjustable gyroscope speed</p> <p>Adjustable gyroscope frame speed</p> <p>Mass of the gyroscope body: 65g</p> <p>Two independently controllable electric motors</p> <p>Transparent protective cover made of plastic 420x400x310mm</p>
20.	Governor Apparatus	1	<p>Demonstration of the principle of operation of various centrifugal force governors</p> <p>Porter, Proell and Hartnell governors</p> <p>DC drive motor</p> <p>Adjustable rotational speed, electronically regulated, with digital display 420x400x430mm</p>
21.	Winch	1	<p>Study of a winch</p> <p>Drum and driving wheel made of aluminum, gear wheels made of POM</p> <p>2 sets of weights</p> <p>Safety catch prevents reversal of direction of rotation</p> <p>Plate for wall mounting made of anodized aluminum</p>
22.	Angular Momentum conservation	1	Bench mounted unit with rotating arms, two sliding weights controlled by a cord. Along with an instruction manual
23.	Force Triangle Apparatus	1	Bench mounted steel table with leveling screws on table legs and protractor attached to table top for angular measurements. Three pulley-clamp units' eighth ball bearing pullies, load cords, load hangers and load cord ring. Along with an instruction manual
24.	Moment of Inertia apparatus	1	<p>Student experiments on moments of inertia, comparison of the inertia of rotation of various bodies</p> <p>Metal rotating bar, weights with knurled bolts for quick fastening</p> <p>Solid and hollow test cylinders</p> <p>Ball bearing mounted rotating drum, anodized aluminum</p> <p>Acceleration of system by weight attached to the drum</p>

Sr. No	Name of Equipment	Qty	Specifications
25.	Centrifugal Force Apparatus	1	Measurement of centrifugal force on rotating masses 5 different path radii 3 different rotating masses Force measuring range 0...25N Rotational speed continuously regulated Digital display of force and rotational speed 420x400x270mm
26.	Twin Rotor System Prototype Machine	1	This system must be scaled model of a non-linear, unstable dynamic MIMO system. It simulates the main & tail rotor systems of a helicopter with their very strong interactions. High-resolution optical encoders must provide feedback of velocity from both. A selection of rotors should be provided to allow modification of the system dynamics. A complete math model of the system should also be supplied, which consists of 2-3rd order differential equations with strong interactions. The system software should use the Matlab environment with a custom designed real-time communications. A versatile analogue and digital I/O card should be supplied with the system to handle interfacing with a controlling PC.
27.	Servo Mechanism Laboratory Prototype Machine	1	Modular Servo instructional servo system with following: Vibration and deformation test module Pressure, flow, temperature, tachometers, proximity, pneumatic test modules
28.	Precision impedance analyzer	1	Frequency range 20Hz to 110 MHz Measurement Display range 130mOhm to 20 KOhm Frequency Sweep Capability with Graphics Display Measurement Parameters Z, Y, O, R, X, G, B, C, L, D, Q Test Fixture Dielectric Materials Test Fixture Measurement Parameters Capacitance, Dissipation Factor, Dielectric Constant Dielectric Test Fixture Frequency 1MHz to 1GHz for smith sheets only
29.	Thermal chamber for thermal analysis	1	Temperature Range: -73°C to +175°C Tolerance Control: $\pm 0.2^\circ\text{C}$; Uniformity: $\pm 0.5^\circ\text{C}$ Input Power: 230V, 50 Hz, 8A Inside Dimensions 16" W x 12" H x 14" D (1.55 Cubic feet) Outside Dimensions Bench Model 115A-B: 24" W x 44" H x 26" D
30.	Scanning electron microscope	1	Capable of producing sharp images at maximum resolution of at least 3nm in the High Vacuum and 3.5nm in low Vacuum mode with latest Electron Optics for diverse imaging capabilities. Such as Electron Channeling Pattern (ECP) Accelerating voltage not less than 30KV. The magnification range of the instrument should be at least between x5 to x1,000,000 or higher Low vacuum ability to observe biological and non-

Sr. No	Name of Equipment	Qty	Specifications
			<p>conducting samples, the system should be equipped with latest imaging capabilities. The system should be easy to maintain without any external water cooling requirement. The specimen stage should be eucentric fully motorized with minimum X and Y Movements: X = 130 mm ,Y = 130 mm , large chamber with minimum dimensions:- 300 mm (width) □300 mm (depth) or more to accommodate large samples. For future expansion the chamber should be equipped with 9-10 Expansion ports.</p> <p>Equipped with CCD infrared camera for internal chamber viewing.</p> <p>Motorized stage movement with easy and safe sample changing abilities to avoid chamber contamination. Preferably With electromagnetic objective aperture assembly for maximum imaging and analytical flexibility. The Microscope should be equipped with latest and maximum Digital image storage capability for best imaging at least 8,000 x 8,000 pixels.</p> <p>For ease of use the system should be equipped with maximum Auto functions i.e.: Auto focus, Auto Contrast and brightness, Auto Stigmator, etc</p> <p>Electron Gun with tungsten filament.</p> <p>Retractable Semiconductor type Backscattered detector with high sensitivity should be provided as standard which should be capable of providing Compositional and Topographical images with fully flexible options for easy viewing.</p> <p>The X-Ray Analysis system should be equipped with LN2 Free detector sensitive to detector light elements Be4 to U92. The system should be equipped with minimum 20mm active area and provided with educational software capabilities with necessary license / CDs.</p> <p>The system should be capable of providing EDS spectra quickly and effectively and to automatically scan for all the elements in the periodic table and to provide quick qualitative and quantitative analysis for polished and unpolished bulk samples with quick report generating software including Templates. The ED System should be supplied with the latest software including Microanalysis encyclopedia.</p> <p>The ED System should be fully upgradeable for any future Requirements i.e. WDS or EBSD etc on one platform</p> <p>Necessary printers should be provided along with the system to print image, EDS spectra and quantitative results.</p> <p>The Vacuum system should be quick, within 3 Mins from cold start up operating automatically with clean vacuum system to avoid contamination. The switch over between</p>

Sr. No	Name of Equipment	Qty	Specifications
			<p>Low and High Vacuum should be fully automatic without any manual valve control.</p> <p>Suitable UPS for 20 minutes backup & complete Microscope operation</p> <p>Metal coating apparatus for specimen preparation using gold and carbon coating.</p> <p>Basic accessories including extra filaments, stubs and apertures etc.</p>
31.	Supersonic wind tunnel including delivery installation, on hands training along with Schlieren Optics Apparatus	1	<p>Supersonic wind tunnel</p> <ul style="list-style-type: none"> - cross section of the measurement section: 100x25mm - interchangeable walls for measuring section 1 x straight contour: $Ma < 1$ 2 x Laval contours: $Ma\ 1,4$ and $Ma\ 1.8$ <p>Schlieren optics</p> <ul style="list-style-type: none"> - halogen lamp with 50 and 100W - 2 adjustable parabolic mirrors - adjustable slit diaphragm - screen for Schlieren optics <p>Drag bodies</p> <ul style="list-style-type: none"> - wedge, double wedge, projectile, rocket <p>Recommended ambient conditions: 40% rel. humidity at 25°C</p>

Issued by: Prof. Dr. Saeed Ahmad
Project Director (SAUG)



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2. The Tender Document(s) can be purchased on Payment of Rs. 5000/- in Habib Bank, Branch UET Taxila on prescribed Challan Form.
3. Tender Document(s) can also be downloaded from official website of UET, Taxila (www.uettaxila.edu.pk) or can be obtained from the office address below. The Bidders may visit the office of Project Director (SAUG) during working hours of University.
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TENDER DOCUMENT

*TENDER DOCUMENT FOR STRENGTHENING AND UP-GRADATION
OF LABS OF ELECTRICAL ENGINEERING*

PAK RUPEES / CNF BASIS

TENDER NO. SAUG/ELEC/2014



**STRENGTHENING AND UP-GRADATION OF
UNIVERSITY OF ENGINEERING & TECHNOLOGY
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UNIVERSITY OF ENGINEERING AND TECHNOLOGY TAXILA
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Phone: 92-51-9047633 Fax: 92-51-9047797

**TENDER DOCUMENT FOR STRENGTHENING AND UP-GRADATION OF LABS OF
ELECTRICAL ENGINEERING ON C&F / PAK RUPEES BASIS**

Part (1): Terms and Conditions

1. Please follow the given terms;
 - a. The firm / bidder shall clearly provide the proof of Registration for GST / NTN on their printed letterheads.
 - b. Tender No., date & timing of opening should be clearly mentioned on the top of envelopes.
 - c. Submit your offer for each tender in separate envelopes.
 - d. No tender documents will be received after the closing date / time.
 - e. Bids will be submitted on "Single Stage two Envelopes" basis.
 - f. In case of closed/forced holidays, tender opening time/date will be considered as the next working day.
 - g. Price should be quoted with all accessories
 - h. It is the responsibility of the supplier to provide all necessary equipment with the basic unit to run the system.
2. Certificate showing that the firm has not been blacklisted or debarred by any Government Department.
3. Preference will be given to those firms which have their Head Office/Branch Office and/or Technical Support/Maintenance Facilities at Rawalpindi, Islamabad or Wah Cantt.
4. The specifications of the equipment to be supplied are attached (**Part 3 of Tender Document**).
5. The material must be according to specifications.
6. The supplier is bound to replace within 15 days all or any part of the equipment found defective during initial inspection by Project Committee. The supplier shall provide replacement of defective items / parts to the purchaser at UET, Taxila main store. The supplier shall also remove defective parts / item(s) from Main Store UET Taxila without claiming any additional Cost.
7. Offers shall remain valid for 120 days from the date of opening. The bidders shall quote their prices inclusive of all duties / Taxes / Packing / Petrol / Transportation / Installation / Demonstration etc and all other expenses on delivery to consignee at UET Taxila premises.
8. The sealed bids complete in all respect must reach in the office of the undersigned along with earnest money (2%) in shape of **CDR to be attached with technical offer.**

9. The sealed tenders, complete in all respects, must reach the undersigned at the time and date notified in the advertisement. **Late receipts shall not be entertained**, whatsoever the reason may be.
10. The tenders shall be opened in the office of the undersigned at the notified date and time. The bidders or their representatives can be present if they so desire.
11. Only those tenders will be entertained which are absolutely clear / unambiguous and legible. Any unavoidable cutting / overwriting must be signed and initialed.
12. The offered items must be brand new and free from any manufacturing defect.
13. The University reserves the rights to inspect the working facilities and equipment of the supplier at any stage.
14. The items shall be supplied **within 45-days** of issuance of the Supply Orders.
15. A penalty of **0.5%** of the total cost or order can be imposed per day for delay on the part of the bidder up to maximum 20 days.
16. The University has the right to increase or decrease the quantum of work according to available budget. Prices must be inclusive of all freight, taxes and duties (if any).
17. In case of failure in the supply, the Project Purchase Committee will have the right to cancel the supply order and forfeit the earnest money and blacklisting.
18. In case of delay, Project Purchase Committee can provide extension in the date of supply to any bidder(s) provided valid reasons are given.
19. The payment shall be subject to satisfactory inspection report from the concerned evaluation committee and 10% of the total billed amount shall be retained by the University for a Period **Not less than Six Months**, as Security.
20. The bidders shall submit separately Technical and financial proposals for qualifying status.
21. Following documents must be attached with the technical proposal.

i.	Last income tax paid certificate (FBR)	vii.	GST / NTN valid Certificates
ii.	Last GST paid certificate (FBR)	viii.	No black listing on stamp paper
iii.	Client List	ix.	Bank Statement (worth 2 Million)
iv.	Work Experience	x.	Company profile
v.	Relevant Experience	xi.	Letter of appreciation from previous clients
vi.	Detail specification of equipment with literature	xii.	Warranty / Guarantee Letter

22. The winning bidder shall have to sign a prescribed agreement on the Stamp Paper of prescribed value (i.e. 0.25% of the total ordered cost) duly stamped from notary public.
23. Payment will be as per under university rule after receipt of the supply and satisfactory inspection.

24. The Project Purchase Committee shall have the powers to reject, in part or as a whole, any one or all the quotations without assigning any reason thereof as per PPRA rules.
25. The Tender / Relevant documents can also be downloaded from official website www.uettaxila.edu.pk of UET, Taxila or can be obtained from the office addressed below. For further queries regarding tender, bidder(s) are encouraged to contact / visit undersigned in the university working hours. Tender Notice can also be seen on website www.ppra.punjab.gov.pk.
26. Tender submitted without challan form (Tender Fee) & earnest money CDR can be rejected at the time of opening of tender. Earnest money & challan form will be submitted against each tender separately.
27. The procuring agency "may reject all bids or proposals at any time prior to the acceptance of a bid or proposal. The procuring agency shall upon request communicate to any supplier or contractor who submitted a bid or proposal, the grounds for its rejection of all bids or proposals, but is not required to justify those grounds".
28. Tender will be opened in Conference Hall, Admin Block UET Taxila at **12:00 noon on 03.02.2014**.

Prof. Dr. Saeed Ahmad
Project Director (SAUG)
University of Engineering & Technology, Taxila
Email: dr_sahmad@yahoo.com



UNIVERSITY OF ENGINEERING AND TECHNOLOGY TAXILA
(STRENGTHENING AND UP-GRADATION OF UNIVERSITY OF
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TENDER NO. SAUG/ELEC/2014

**PART (2): SCHEDULE OF REQUIREMENTS FOR THE PURCHASE OF LAB EQUIPMENT FOR
ELECTRICAL ENGINEERING**

The delivery of services and supply will be made in 45 days after issuance of Purchase Order (without penalty) and with the prescribed penalty as per following schedule of requirement:

MODE OF PENALTY	NO OF DAYS	TOTAL DELIVERY PERIOD
Without Penalty	45 days	45 days
With Penalty @ 0.5 % per day on the delayed completion of task	50 days (5 days after 45 days)	50 days (45 + 05)

PRICE SCHEDULE FOR THE EQUIPMENT ON PAK RUPEES BASIS:

Name of Bidder: _____

The Equipment to be completed is tabulated as under:

S. No.	Item (s)	Qty	Unit price (Rs)	GST (Rs) 17%	Total Cost including GST(Rs)	Bid Security (2% of the Total Cost)
1.						
2.						
3.						

PRICE SCHEDULE FOR THE EQUIPMENT ON CNF BASIS:

Name of Bidder: _____

S. No.	Item(s)	Qty	Currency Type	Unit Cost (CNF)	Total Cost	Bid Security (2% of the Total Cost)
1.						
2.						
3.						

Signature of the Bidder: _____ Stamp of Bidder: _____

Note: In case of discrepancy between unit price and total, the unit price shall prevail.

Issued by: Prof. Dr. Saeed Ahmad
Project Director (SAUG)



UNIVERSITY OF ENGINEERING AND TECHNOLOGY TAXILA
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Tender Document
Part (3): Specifications

S. No.	Item	Specifications	Qty
1.	OrCAD CAPTURE	<p>Power Quality Analysis, Measurement And Protection Software</p> <p>Should Contain The Following Features:-</p> <ul style="list-style-type: none"> • Measure Power Quality And Energy Features To IEC, EN, And IEEE Standards • Harmonics (IEC 61000-4-7) And Flicker (IEC 61000-4-15) • Phasor Measurement Unit (C37.118) [Professional Edition Only] • Sag/Swell/Interruption With Standard Or Custom Levels (IEC 61000-4-30) • Rapid Voltage Change With Standard Or Custom Levels (IEC 61000-4-30) • Compatibility With The COMTRADE (IEEE 37.111) File Format • Integration With Labview And Mathscript 	5
2.	PSpice A/D	<p>Advanced, Industry-Standard, SPICE Simulation Environment Optimized For Power Electronics Simulation</p> <p>Should Include The Following:-</p> <ul style="list-style-type: none"> • Single Simulation Environment For Simulation Complete Power Electronics Design At Both Analog And Digital Level • Various Power Electronics Components Including Transformers, Switches, Gate Drivers, Passive Components And Motors For High Fidelity Simulation Of Power Systems • Optimize Design Behavior With 20 Advanced Analyses And 22 Virtual Instruments • Comprehensive Database Of More Than 17,500 Devices And Simulation Models • Advanced Integration With Real Measurement Data For Custom Design Verification • Advanced Project Management; Includes Project Packing, Version Control, Advanced Spreadsheet View • Integrated With NI Ultiboard Layout For Complete And Streamlined Prototyping <ul style="list-style-type: none"> ▪ 19 Industry-Standard Analyses, Such As AC Analysis And Monte Carlo, For Greater Design Insight ▪ Error Identification At The Earliest Stages Of The Design Flow To Improve Characteristic Performance ▪ Integration With Hardware Test Platforms Including ELVIS And Standalone Hardware 	5
3.	Layout Plus	<p>Printed Circuit Boards (Pcbs) Layout Software Optimized For Power Electronics Layout.</p> <p>Should Include The Following Features:</p> <ul style="list-style-type: none"> • Flexible Environment Optimized For Rapid Design And Accurate Part Or Copper Placement • Engineer-Friendly Interface For Laying Out And Routing Pcbs • Seamless Integration With Multisim To Ensure Accurate Transfer Of Simulated Designs • Comprehensive Database Of Connector Footprints For Custom 	5

S. No.	Item	Specifications	Qty
		Designing NI Hardware And Test Platforms <ul style="list-style-type: none"> • Easy Export To Industry-Standard Gerber Or DXF Formats For Prototyping And Fabrication • Layout And Routing Tools To Easily Define Copper And Part Placement • Cross-Probing With Multisim To Ensure Comprehensive Understanding Of Design At Schematic And Layout • Flexible And Integrated Design Environment With Unlimited Pin Counts And Up To 64-Layer Designs • Easy-To-Use Tools For Part Placement Such As Push-And-Shove, Pick-And-Place, And Autoplacement • Advanced Options And Settings To Prioritize Placement, As Well As Group And Layer Routing ▪ Integration With Hardware Test Platforms Including ELVIS And Standalone Hardware 	
4.	SPECCTRA 6U	Electrical Power System Simulation Software Electrical System (Power Electronics, Power System, Etc) Simulation Tool. Contains The Following Features:- <ul style="list-style-type: none"> • Tight Integration With Labview/Matscript Software • Accurate State-Space Based Simulation Method • Fast Simulation Speed • Domain Specific Components (Three-Phase Distributed Line, Three-Phase Transformer, Etc) • Easy To Use, Well-Packaged Three-Phase Components Support For The Following Components:- <ul style="list-style-type: none"> • Sources(Controlled Voltage Source, Controlled Current Source ,AC Voltage Source ,DC Voltage Source ,Three-Phase AC Voltage Source) • Switches (Diode ,Thyristor ,IGBT ,IGBT With Diode ,MOSFET ,MOSFET With Diode ,Breaker ,Three-Phase Breaker ,2-Level Switch Bridge ,3-Level Switch Bridge ,Anti-Parallel Thyristors ,Machines ,DC Machine ,Induction Machine ,Synchronous Machine ,Permanent Magnet Synchronous ,Machine ,Brushless DC Machine • Passive Components (Resistor ,Inductor, Capacitor, Three-Phase Parallel RLC ,Branch ,Three-Phase Parallel RLC ,Branch ,Linear Transformer ,2Windings Three-Phase Transformer ,One-Phase Distributed Line ,Three-Phase Distributed Line ,Three-Phase PI Section Line ,Ground) • Meters (Voltmeter ,Three-Phase Meter ,Ammeter • Terminals(Input Terminal ,Output Terminal) 	5
5.	Power Electronic Trainer	Power Electronics Measurement System <ul style="list-style-type: none"> • 3 Phase Power Analyzer With Advance Measurement Analysis • Open Hardware With Labview And Matlab Interface • Software Functionality <ul style="list-style-type: none"> -FFT Analyzer -Vectorscope, Oscilloscope 	5

S. No.	Item	Specifications	Qty
		<ul style="list-style-type: none"> -Power And Energy Monitor -EN 50160 Voltage Monitor Including Flickermeter -Symmetrical Components Analyzer Of 3-Phase System -Power Network Impedance Analyzer -Half-Period RMS Monitor -Transient Recorder And Fault Recorder -Voltage Telegrams And Alarms -Digital Inputs • Smart Grid Utility Network Protocol Support(DNP3, IEC 60870, IEC 61850, Modbus, CAN, ...) And Onboard Real-Time 3-Phase Power And IEC 61000-4-7:2002 Harmonic Spectra Analysis 	
6.	DSP Board R&D Controller Kit	<p>FPGA-Based DSP System For Control Of Multi-Level Power Conversion Topologies, Including DC/AC, DC/DC, AC/AC And AC/DC</p> <p>Should Contain The Following Features:-</p> <ul style="list-style-type: none"> • Deployment-Ready Control And I/O System Carefully Optimized For Teaching And Research Grade Grid-Tied Power Conversion Applications. • FPGA-Based Control System With 58 Integrated DSP Cores Delivers 40x Higher Performance Per Dollar Than Traditional Dsps And Silicon Gate Level (SGL) Reconfigurable Even After Years Of Field Deployment • High Level Labview Graphical System Design Tools And Reconfigurable FPGA Enable Rapid Development Of Advanced Control Algorithms Without Requiring Any Knowledge Of Verilog Or VHDL • User Defined FPGA Control And PWM Adaptable To A Wide Range Of Single And Multi-Level Power Conversion Topologies, Including DC/AC, DC/DC, AC/AC And AC/DC • Complete, Industry Proven Labview Tool Chain With FPGA I/O Drivers, IP Libraries And High Fidelity Power Electronics Circuit Co-Simulation Tools • 400 Mhz Powerpc Processor With Vxworks RTOS For Hard Real-Time Floating Point Processing, Networking, And Event Capture Data Logging • Smart Grid Utility Network Protocol Support (DNP3, IEC 60870, IEC 61850, Modbus, CAN, ...) And Onboard Real-Time 3-Phase Power And IEC 61000-4-7:2002 Harmonic Spectra Analysis • 10/100BASE-TX Ethernet Port With FTP, HTTP, HTTPS And SSL Support And SNTP Or IEEE1588 Time Synchronization • DMA Data Scope Capabilities For High Speed Waveform Capture And Automatically Triggered Event Recording • I/O Compatibility With Most Standard Gate Drivers And Intelligent Power Modules— Fuji, Infineon (Econodual™), Hitachi, Mitsubishi, Powerex, SEMIKRON (Skiip 3 And 4), Toshiba, ... 	5
7.	Motor Sets	<p>Power: 1500VA, 3Ø (61701)</p> <p>3000VA, 3Ø (61702); 4500VA, 3Ø (61703)</p> <p>6000VA, 3Ø (61704); 12000VA, 3Ø (61705)</p> <p>Voltage: 0~150V/0~300V</p> <p>Frequency: 15~1.2khz</p>	5

S. No.	Item	Specifications	Qty
		<p>Phase Angle: 0~360°</p> <p>Must Include Computer Based Control Using Labview For Generating Power Output Profile</p> <p>Built-In PFC, Provides Input Power Factor Over 0.98</p> <p>Advanced PWM Technology Delivers High Power Density In A Compact Rack-Mountable Package</p> <p>Built-In Output Isolation Relays</p> <p>AC+DC Output Mode</p> <p>Programmable Slew Rate Setting For Changing Voltage (Optional Function)</p> <p>Turn On, Turn Off Phase Angle Control</p> <p>User-Definable Power-On Status</p> <p>Optional Function For Power Line Disturbance (PLD) Simulation Capability</p> <p>Comprehensive Measurement Capability: V, Irms, Ipk, I Inrush, P, PF, CF Of Current Etc.</p> <p>Programmable R.M.S. Current Limit</p> <p>Full Protection: OP, OC, OV And OT Protection</p> <p>Optional GPIB And RS-232C Interface</p> <p>Easy-Use Software For Operation</p>	
8.	Drives Board	<p>DC Drive</p> <ul style="list-style-type: none"> Continuous Current Of Up To 7.3 A At 30 V Use Data From Current Sensor For Flexible Sampling Time And Filtering Of The Motor Current Full H-Bridge Brushed Servo Motor Drive With A Built-In Encoder Interface And Current Sensor Direct Connectivity To Actuators - Fractional Horsepower Brushed DC Servo Motors, Relays, Lamps Create Custom Current-Loop Algorithm For Optimized Torque Control With Labview FPGA Module <p>AC Drive</p> <ul style="list-style-type: none"> 1/3 Phase Inverter Drive - 10 A, 600 V Short-Circuit Rugged IGBT Compatibility With General Purpose Inverter Control For Power Electronics Training And Design Minimum Input Voltage: 125 VDC Or 90 VAC Maximum Input Voltage: 350 VDC Or 220 VAC Capable Of Using External +15 V Supply Voltage Maximum Output Power For Motor: 1000 W Regenerative Brake Control Feature Input Inrush Limitation With Bypassing Relay +15 V Auxiliary Power Supply Based On Buck Converter With Viper16 Fully-Populated Board With Test Points Motor Control Connector For Interfacing With STM3210B-EVAL Board And Other ST Motor Control-Dedicated Kits Tachometer And Hall/Encoder Inputs Compatible With BEMF Daughterboard For Sensor-Less Six- 	5

S. No.	Item	Specifications	Qty
		Step Control Of BLDC Motors <ul style="list-style-type: none"> Rohs Compliant 	
9.	Oscilloscope, 100Mhz, 4 Channel	Computer Based Oscilloscope/Digitizer With The Following Features:- <ul style="list-style-type: none"> 4 Channel 100mhz Oscilloscope Open Architecture And Flexible, Software-Defined Functionality To For Both Time- And Frequency-Domain Applications Standard Oscilloscope Measurements As Well As Ability To Perform Other Measurements, Such As Spectrum Analyzers, Transient Recorders, And Ultrasonic Receiver Advance Trigger And Synchronization Capability USB Interface For Computer Interfacing Labview/Matscript Drivers For Custom Analysis High Voltage Probes And Voltage Transformers For Power Electronics Application 	5
10.	Power-Pole Board for PE Lab, Equipment & Accessories	Power Electronics Teaching Platform <ul style="list-style-type: none"> Test And Measurement Suite For Power Electronics Design, Contains <ul style="list-style-type: none"> Computer Based Test And Measurement For Power Electronics Teaching And Research 50mhz 2 Channels Oscilloscope, 5 Mhz Function Generator/Arbitrary Waveform Generator, 5.5 Digits Multimeter, LCR Meter, Variable Power Supply, Bode Analyzer, Impedance Analyzer, 2 & 3 Wire IV Analyzer, Spectrum Analyzer, Multifunction Data Acquisition, Power Electronics Components <ul style="list-style-type: none"> Smoothing Inductor, Tandem Rheostat, IGPT, Power Thyristor, Power Diodes, TRIAC, Loads <ul style="list-style-type: none"> Resistive And Capacitive Loads 3 Phase PNSM Motor Power Electronics Simulation Suite For Development/Testing/Debugging And Validation (Co-Simulation Of Both Analog And Digital Circuits, Ability To Design And Test New Control Algorithms, Power Electronic Components From Major Manufacturers) FPGA For Digital Control/Switching/Triggering Of Power Electronics Circuits Integration With Graphical System Design Software Courseware Manual And Books Courseware For Experiential Learning Of The Following Concepts;- <ul style="list-style-type: none"> RLC TRIAC Light Dimmer Simple CHAOTIC Circuits Fly Back Converter Boost Converter Buck Converter 3-Phase Single Level Inverter Thermal Simulation DC Motor H Bridge Brushed DC Motor With Gate Drive Circuit Brushless DC Motor With Hall Sensors 	5

S. No.	Item	Specifications	Qty
11.	Power Pole Board	<p>Preamsembled Printed Circuit Board With 16 Different Circuits.</p> <p>Must Cover The Below Concepts:-</p> <ul style="list-style-type: none"> Operating Principles Of Voltage And Current Regulators, DC-AC And DC- DC Converters, Measure The Operational Characteristics Of AC Voltage And Current Generators, Parameters Of Single-Phase And Triphase Transformers And Rectifiers, As Well As Diodes, Zener Diodes And SCRs. Course Manual Uld Be Sho Embedded In Lab Software For Easy Access To Ad-Hoc Theoretical Materials During The Lab. Experimental Results, Including Student Name, Date & Time, Etc. May Be Exported And Saved In MS EXCEL Format. 12+ Instruments For Current, Voltage And Power Measurement With Computer Interface. 	1
12.	Power Supply,	<p>POWER SUPPLY, BENCH, 40V</p> <ul style="list-style-type: none"> Power Supply Output Type: Adjustable No. Of Outputs: 1 Output Voltage Min: 1V Output Voltage Max: 40V Output Current Min: 0A Output Current Max: 5A Power Rating: 200W Input Voltage: 90VAC To 265VAC 	1
13.	Single Power Supply (12V, 0.3A; -12V, 0.3A)	<p>7.5-W models provide both ± 12-V and ± 15-V outputs.</p> <p>Inputs: 10.2 to 27.6 VDC (DC input)</p> <p>65 mm depth enables mounting onto control panels with 100 mm depth.</p> <p>UL and CSA approved.</p> <p>RoHS-compliant</p>	1
14.	Differential Probe (100MHz)	<ul style="list-style-type: none"> Bandwidth (-3 Db) 25 Mhz Differential Mode Voltage (RMS Or DC) 1000 V Differential Mode Voltage (Peak)*1 1300 V Attenuation (Switchable) 50x/500x CMRR At 60 Hz / 1 Mhz (Typical) 80 Db / 50 Db Input R (Each Input) 4 MΩ Input C (Each Input) 7 Pf 	1
15.	Function Generator (0.1Hz ~ 1Mhz)	<p>Add-On Module For Function Generator With The Following Speciation:-</p> <ul style="list-style-type: none"> 20mhz 14bit Function Generator Module Open Architecture And Flexible, Software-Defined Functionality To For Both Time- And Frequency-Domain Applications Generate Arbitrary Wave Form For Custom Power Electronics Test Sweeping Capability Advance Trigger And Synchronization Capability USB Interface For Computer Interfacing Labview/Matscript Drivers For Custom Analysis 	1
16.	Digital Multimeter	<ul style="list-style-type: none"> Display Digits = 3.75 Display Type = LCD, Bar Graph Display Count = 4000 Function = Voltage, Current, Resistance, Capacitance, 	1

S. No.	Item	Specifications	Qty
		Frequency, Temperature	
17.	Plug in Board (20 pin proto board)	<ul style="list-style-type: none"> Hole Diameter = 0.036 Inches Board Thickness = 0.032 Inches 	2
18.	Crimp Connectors (spade crimp)	<ul style="list-style-type: none"> Stud/Tab Size 4 Stud Width - Outer Edges 0.218" (5.54mm) Length – Overall 0.674" (17.12mm) Mounting Type Free Hanging (In-Line) Termination Crimp Wire Gauge 16-22 AWG Insulation Insulated Features Serrated Termination Insulation Diameter 0.105" ~ 0.140" (2.67mm ~ 3.56mm) Material – Insulation Polyamide (PA), Nylon 	10
19.	BNC Cable (3 feet)	<ul style="list-style-type: none"> Coaxial Cable Type: RG223 Double Shielded 50 Ohm Cable Assembly Impedance: 50ohm Cable Length - Imperial: 3ft Cable Length - Metric: 609.6mm Connector Type A: BNC Straight Plug Connector Type B: BNC Straight Plug Rohs Compliant: Yes 	2
20.	BNC Cable (2 feet)	<ul style="list-style-type: none"> COAXIAL CABLE ASSEMBLY Coaxial Cable Type: RG58C Impedance: 50ohm Cable Length - Imperial: 24" Cable Length - Metric: 0.61m Connector Type A: BNC Straight Plug Connector Type B: BNC Straight Plug 	2
21.	BNC Mini Garber	<ul style="list-style-type: none"> Lead Length: 139.7mm Test Connector Type A: BNC Jack Test Connector Type B: Minigrabber Voltage Rating: 60V Rohs Compliant: Yes 	1
22.	Rheostat	<ul style="list-style-type: none"> RHEOSTAT, WIREWOUND, 25 OHM, 100W Track Resistance: 25ohm Track Taper: Linear Resistance Tolerance: $\pm 10\%$ Power Rating: 100W Resistor Element Type: Wirewound Adjustment Type: Side Potentiometer Mounting: Panel No. Of Turns: 1 Rohs Compliant: Yes 	1
23.	Rheostat Knob	<ul style="list-style-type: none"> ROUND KNURLED DIAL KNOB, 6.4MM Knob / Dial Style: Round Knurled With Indicator Line Shaft Diameter: 6.4mm Knob Diameter: 33mm Shaft Type: Round Knob Material: Plastic Body Material: Plastic Color: Black Knob Dia - Imperial: 1.3" Rohs Compliant: Yes 	1
24.	Banana Wire (black)	<ul style="list-style-type: none"> Cable Color: Black Cable Length: 3ft Insulator Color: Black Insulator Color: Black Lead Length: 36 " Lead Length: 36" Rohs Compliant: Yes 	8

S. No.	Item	Specifications	Qty
		<ul style="list-style-type: none"> SVHC: No SVHC (20-Jun-2013) Test Connector Type A: Banana Stackable Test Connector Type A: Banana Stackable Test Connector Type B: Banana Stackable Test Connector Type B: Banana Stackable Voltage Rating: 5 Kv Voltage Rating: 5kv 	
25.	Banana Wire (White)	<ul style="list-style-type: none"> Lead Length: 60" Insulator Color: White Test Connector Type A: Banana Stackable Test Connector Type B: Banana Stackable Voltage Rating: 5kv Rohs Compliant: Yes 	8
26.	Power Supply	<ul style="list-style-type: none"> Universal Input Voltage (85 VAC To 265 VAC) Regulated Output Voltage 24 VDC, 6.3 A Peak Current = 9.5 Short Circuit/Overload/Overvoltage Protection Optimized For Power Electronics And Motor Applications 	1
27.	Transfer Function Analyzer (0.1Hz ~1Mhz)	<p>FREQUENCY Range 0.02 Hz to 25.5 kHz Spans 1 Hz to 25 kHz in a 1-2.5-5-10 sequence Accuracy $\pm 0.003\%$ of display center frequency Resolution 0.4% of the frequency span for single channel or 0.8% of the frequency span for dual channels</p> <p>AMPLITUDE Display Modes Log 10 dB/division or 2 dB/division Linear constant voltage/division</p> <p>Measurement Range Log +30 dBV to -120 dBV noise floor Linear +30 V to 1μV noise floor Dynamic Range 70 dB DC response adjustable to >40 dB below maximum input level</p> <p>Accuracy At the Pass band Center ± 0.5 dB Flat top filter +0, -0.1 dB Hanning filter +0, -1.5 dB Uniform filter +0, -4.0 dB Note: Overall accuracy is the sum of the accuracy at the pass band center plus the selected filter accuracy.</p> <p>Resolution Log 0.1 dB Linear 3 digits</p> <p>PHASE Display Range +200° to -200° Accuracy $\pm 10^\circ$ Resolution 1°</p> <p>TRANSFER FUNCTION Measurement Range Log +160 dB full scale to -80 dB full scale Linear 4 X 108 full scale to 4 X 10-8 full scale Phase display range +200 degrees to -200 degrees</p> <p>INPUT Impedance 10⁶Ω \pm 5% shunted by <60 pF from input high to low (for less than 75% relative humidity) Isolation input low may be floated up to 30V Coupling Switch selection of ac or dc coupling, The low frequency 3 dB roll off is <1 Hz Common Mode Rejection >58 dB</p>	2

S. No.	Item	Specifications	Qty
28.	Sweep Function Generator (0.1Hz ~20Mhz)	Built-in with Storage Oscilloscope Dual Channel 200MHz	2
29.	Spectrum Analyzer (0 - 20 Mhz)	<p>Add-On Module For Spectrum Measurement With The Following Features:-</p> <ul style="list-style-type: none"> • 2 Channel 500mhz Spectrum Analysis • Advance Software For Spectral Measurement(Power Spectrum, Peak Power And Frequency, In-Band Power, Adjacent-Channel Power, And Occupied Bandwidth, As Well As 3D Spectrogram Capabilities) • Advance Trigger And Synchronization Capability • USB Interface For Computer Interfacing • Labview/Matscript Drivers For Custom Analysis • High Voltage Probes And Voltage Transformers For Power Electronics Application 	3
30.	Digital Frequency Meter (0.01 Hz ~ 20 Mhz)	<p>Voltage And Current Measurement Module With The Below Specification:-</p> <p>Voltage Measurement:</p> <ul style="list-style-type: none"> • 600 Vrms Channel-To-Channel Isolation • 50 Ks/S/Ch Simultaneous Inputs (Frequency Measurement Range = 25khz) • Built-In Antialias Filters • 300 Vrms Measurement Range • Connectors And High-Voltage Backshells Included • Integration With Power Quality Analysis Suite For Computer Based Analysis <p>Current Measurement</p> <ul style="list-style-type: none"> • 5 Arms Measurement (14 A Peak) • 50 Ks/S/Ch Simultaneous Inputs • Built-In Antialias Filters • Screw Terminal Connectors Included, Protective Backshells Sold Separately • 250 Vrms Channel-To-Channel Isolation • Integration With Power Quality Analysis Suite For Computer Based Analysis 	2
31.	Wireless Access point for 30 users 16-DB	<p>Date Transmission</p> <p>Data transfer rate (max): 1000 Mbit/s</p> <p>Supported data transfer rates: 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, 54</p> <p>Ethernet LAN data rates: 10, 100, 1000 Mbit/s</p> <p>Frequency band: 2.4/5 GHz</p> <p>Wireless technology: 802.11a/g/n</p> <p>Channel bandwidth: 20, 40 MHz</p> <p>Ports & Interface</p> <p>Cabling technology: 10/100/1000BASE-T(X)</p>	1

S. No.	Item	Specifications	Qty
		<p>Ethernet LAN (RJ-45) ports: 2</p> <p>Security</p> <p>Security algorithms: 802.1x RADIUS, EAP, WPA, WPA-AES, WPA-TKIP, WPA2</p> <p>Management features</p> <p>Web-based management: Y</p> <p>QoS support: Y</p> <p>Certificates</p> <p>Compliance industry standards: IEEE 802.11a/b/g, IEEE 802.11n 2.0, IEEE 802.11h, IEEE 802.11d</p> <p>Safety: UL 60950-1, CAN/CSA-C22.2 No. 60950-1, UL 2043, IEC 60950-1, EN60950-1</p> <p>Certification: FCC 15.247, 15.407;RSS-210;EN 300.328, EN 01.893;ARIB-STD33;ARIB-STD 66;ARIB-STD T71;EMI;FCC 15.107, 15.109;ICES-003;VCCI;EN 301.489-1, -17;EN 60601-1-2.</p> <p>Power</p> <p>Power consumption (typical): 12.95 W</p> <p>Power requirements: 100 - 240 V, 50/60 Hz</p> <p>Power supply type: AC</p> <p>Memory</p> <p>Flash memory: 32 MB</p> <p>Internal memory: 128 MB</p> <p>LED indicators: Y</p> <p>Antenna</p> <p>Antenna type: Omni</p> <p>Antenna gain level (max): 4 dBi</p>	
32.	PCB Prototyping Systems.	<p>Working area (X/Y/Z) 278mm x 360mm x 70mm</p> <p>Clamping area (X/Y) 415mm x 530mm</p> <p>Resolution 0,23 µm</p> <p>Repeatability 1 µm</p> <p>Drilling speed 120 strokes/min</p> <p>X/Y drives Hybrid motors</p> <p>Z drive Hybrid motor</p> <p>Spindle motor 60,000 rpm, software-controlled</p> <p>Machine table Flat-milled T-slot table</p>	1

S. No.	Item	Specifications		Qty
		<div>Tool changing</div> <div>Tool holder</div> <div>Engraving head</div> <div>Dimensions (W x D x H)</div> <div>Weight</div> <div>Power</div> <div>Included software</div> <div>Optional accessories</div> <p>In addition if you need SMT soldering line you can ask for</p> <p>1) Manual Paste Printer size as per matching PCB along with soldering paste 2kg</p> <p>2) 3 Stage reflow oven for PCB size 300mm wide</p>	<div>Manual with convenient pushbutton</div> <div>1/8" standard; others available as options</div> <div>With micron-level depth adjustment</div> <div>440mm x 585mm x 390mm</div> <div>40 Kg</div> <div>115/ 220VAC, 50 - 60 Hz</div> <div>3D CAM</div> <div>Vacuum table, camera, sound enclosure, milling head lamp, power-switch</div>	
33.	Oscilloscope Duel-Ch 200 MHz (with Storage)	<div>Number of channels</div> <div>Bandwidth (-3dB)</div> <div>Bandwidth limiting (-3dB)</div> <div>Rise time</div> <div>Resolution bits</div> <div>Enhanced vertical resolution bits</div> <div>Input characteristics</div> <div>Input ranges (full scale)</div> <div>Input sensitivity</div> <div>Analog offset range ranges)</div> <div>DC accuracy</div>	<div>4 channels</div> <div>200 MHz for Pico Scope 5244A/B and 5444A/B</div> <div>20 MHz, switchable</div> <div>1.8 ns for 200 MHz models</div> <div>8 bits, 12 bits, 14 bits, 15 bits, 16 bits</div> <div>Hardware resolution + 4 bits</div> <div>1 MΩ \pm1% 13 pF, \pm1 pF</div> <div>\pm10 mV to \pm20 V full scale, in 11 ranges</div> <div>2mV/div to 4 V/div (10 vertical divisions)</div> <div>250 mV (10, 20, 50, 100, 200 mV ranges)</div> <div>\pm2.5 V (500 mV, 1 V, 2 V ranges)</div> <div>\pm20 V (5, 10, 20 V ranges)</div> <div>\pm50 mV to \pm20 V</div> <div>\pm50 mV to \pm20 V</div>	5

S. No.	Item	Specifications	Qty
		<p>± 10 mV and ± 20 mV ranges</p> <p>Advanced triggers Edge, Window, Pulse width, Window pulse width, Dropout, Window dropout, Interval, Runt pulse, Logic.</p> <p>Trigger types (ETS mode) Rising, falling</p> <p>Maximum trigger rate burst Up to 10,000 waveforms in 20 ms</p> <p>Bandwidth (200 MHz) DC to full oscilloscope bandwidth</p> <p>Voltage range ± 5 V, DC coupled</p> <p>Overvoltage protection ± 100 V (DC + AC peak)</p> <p>Automatic Measurement AC RMS, true RMS, DC average, cycle time, frequency, duty cycle, falling rate, fall time, rising rate, rise time, high pulse width, low pulse width, maximum, minimum, peak to peak</p> <p>FUNCTION GENERATOR(Built – in)</p> <p>Standard output signals voltage Sine, square, triangle, DC</p> <p>Standard signal frequency DC to 20 MHz</p> <p>Output frequency accuracy MHz models ± 50 ppm (± 5 ppm/year) for 60</p> <p>± 2 ppm (± 1 ppm/year) for 100 MHz and 200 MHz models</p> <p>Output frequency resolution < 0.05 Hz</p> <p>Output voltage range accuracy ± 2 V with $\pm 1\%$ DC</p> <p>Output voltage adjustment Signal amplitude and offset adjustable in approx. 0.25 mV steps within overall ± 2 V range</p> <p>Amplitude flatness @ 50 Ω load < 2 dB to 20 MHz, typical</p> <p>SFDR sine wave > 70 dB, 10 kHz full scale</p> <p>Connector type impedance BNC, 50 Ω output</p>	

S. No.	Item	Specifications	Qty
		<div>Overvoltage protection</div> <div>$\pm 20\text{ V}$</div> <div>Sweep modes</div> <div>Up, down, or alternating, with selectable start/stop frequencies and increments</div> <div>AWG (B models only)</div> <div>Update rate</div> <div>200 MS/s</div> <div>Buffer size and 5442B</div> <div>16 kS - PicoScope 5242B</div> <div>32 kS - PicoScope 5243B and 5443B</div> <div>48 kS - PicoScope 5244B and 5444B</div> <div>Resolution approximately 0.25 mV</div> <div>14 bits (output step size</div> <div>Bandwidth</div> <div>> 20 MHz</div> <div>Rise time (10% to 90%)</div> <div>< 10 ns</div> <div>Output characteristics</div> <div>600 Ω</div> <div>Output frequency</div> <div>1 kHz</div> <div>Output level</div> <div>3 V pk-pk</div> <div>Overvoltage protection</div> <div>10 V</div> <div>SPECTRUM ANALYZER (Built-in)</div> <div>Frequency range</div> <div>DC to full oscilloscope bandwidth (60, 100 or 200MHz)</div> <div>Display modes</div> <div>Magnitude, average, peak hold</div> <div>Windowing functions</div> <div>Rectangular, Gaussian, triangular, Blackman, Blackman-Harris, Hamming, Hann, flat-top</div> <div>Number of FFT points 2</div> <div>Selectable from 128 to 1 million in powers of 2</div> <div>MATH CHANNELS</div> <div> $-x$, $x+y$, $x-y$, $x*y$, x/y, x^y, sqrt, exp, ln, log, abs, norm, sign, sin, cos, tan, arcsin, arccos, arctan, sinh, cosh, tanh, delay </div> <div>A, B, C, D (input channels), T (time), reference waveforms, pi</div> <div>Automatic Measurements</div> <div>AC RMS, true RMS, DC</div>	

S. No.	Item	Specifications	Qty
		<p>average, cycle time, frequency, duty cycle, falling rate, fall time, rising rate, rise time, high pulse width, low pulse width, maximum, minimum, peak to peak</p> <p>Spectrum</p> <p>Frequency at peak, amplitude at peak, average amplitude at peak, total power, THD %, THD dB, THD+N, SFDR, SINAD, SNR, IMD</p> <p>Statistics</p> <p>mum, maximum, average and standard deviation</p> <p>SERIAL DECODING I²C, I²S, SPI, RS232/UART, CAN, LIN, Flex Ray</p>	
34.	Electronics Demonstration System for Electronics Circuits	<ul style="list-style-type: none"> Modular system for teaching analog and digital communication electronics using hardware blocks, latest Test and Measurement and digital signal processing using LabVIEW. 20 circuit blocks for fundamental communications operations allowing students to develop live communication systems. 12+ Integrated Suite of Test and Measurement containing 50MHz 2 Channels Oscilloscope, 5 MHz Function Generator/Arbitrary Waveform Generator, 5.5 Digits Multimeter, LCR meter, Variable Power Supply, Bode Analyzer, Impedance Analyzer, 2 & 3 wire IV Analyzer, Spectrum Analyzer, Multifunction Data Acquisition, Breadboard for teaching Analog and Digital Electronics and Free Courseware. Signal Processing and Analysis using LabVIEW/mathscript Covers analog and digital communications concepts such as AM, FM, DSB, SSB, PAM, PCM, PWM, speech, SNR, equation modeling, sampling, TDM, PCM, ASK, FSK, BPSK, QPSK, QAM, DSSS, noise generation, OFDM and more. Extendable to cover experiments on Signals and Systems and Digital Signal Processing. Prepackaged with comprehensive curriculum materials that reduce lab-planning requirements. Ability to design and develop new experiments using LabVIEW and ardware 	5
35.	Variable Digital Power Supply (0-30V) (3A)	<p>Output Voltage Ch1, Ch2 0~32V</p> <p>Output Current Ch1, Ch2 0~3A</p> <p>Overload Effect $CV \leq 1 \times 10^{-4} + 2mV$, $CC \leq 2mA$</p> <p>Ripple & Noise $CV \leq 1mV_{rms}$, $CC \leq 1mA_{rms}$</p> <p>Regulation CV - 20mV (Typical Value), CC - 50mV (Typical Value)</p> <p>Tracking Error $5 \times 10^{-3} + 2mV$</p> <p>Reliability MTBF (e): ≥ 2000 hours</p>	25

S. No.	Item	Specifications	Qty
		Triple Output Series or Parallel Operation Current Limitation Auto Switching Between Voltage and Current Operation	
36.	Function Generator (Digital) (.1 HZ - 2 MHZ) (.1 V - 40 V)	Waveforms Standard Waveforms Sine, Square, Triangle, Ramp up, Ramp down, Random Noise, SIN (X) / X, Exponential Rise, Exponential Fall, Pulse. Amplitude Characteristics Range (no load) from 1mVp-p to 20Vp-p Accuracy $\pm 5\%$ (Sine at 1kHz) Resolution 0.01mV Frequency Characteristics Range of Sine from 1μHz to 5MHz Range of Square from 1μHz to 5MHz Range of Other Waveforms from 1μHz to 1MHz Stability 50ppm (from -10°C to 40°C) Resolution 0.1μHz or 8 digit Accuracy 0.1μHz (<100Hz), 0.4Hz (>100Hz) Signal Characteristics Harmonic Distortion of Sine <20kHz: -60dBc, 20kHz to 1MHz: -50dBc, 1MHz to 10MHz: -40dBc, 10MHz to 20MHz: -30dBc Square, Pulse Rise/Fall Time <20ns Overshoot <5% Asymmetry 1% + 20ns Duty Cycle of Pulse 0.1% to 99.9% Linearity of Triangle, Ramp <1% Modulation Characteristics Modulation Mode Linear sweep (LIN SWP), logarithmic sweep (LOG SWP), FDK, PSK, ASK, BURST, INF FM, INT PM, INT AM, and external AM	25

S. No.	Item	Specifications	Qty
		(EXT AM) Output Characteristics Output A (Main Output) Output Impedance 50Ω DC Offset Vpeak from -100% to 100% Output B Waveform All internal waveform Amplitude load) 200mVp-p to 20Vp-p (no Output Impedance 600Ω Frequency Range 0.1Hz to 20kHz Frequency Counter Range: 1Hz to 100MHz, Amplitude Range: 100mV to 5V RS-232 Interface 9600Baud, N, 8, 1	
37.	Digital Multimeter (Japan)	USB Interface 6000 Counts Diode Test / Buzzer Relative measurement Data hold Back Light Display MIN/MAX measurement Auto Power OFF PC link software In Conformity with IEC1010 CATII 1000V DC Voltage: 0.1mV ~ 1000V DC Current: 0.1uA ~ 10A AC Voltage: 0.1mV ~ 1000V AC Current: 0.1uA ~ 10A Resistance: 0.1Ω ~ 40M Ω Capacitance: 0.01nF ~ 100μF Frequency / Duty cycle: 10Hz ~ 100Hz	25

S. No.	Item	Specifications	Qty																						
		Temperature: 55 ~ 1000°C																							
38.	Analog Multimeter (Japan)	DCV 0.1/ 0.25/2.5/10/50/250/1000 ACV 10/50/250/750 DCA 50u/2.5m/25m/0.25 Ω 2k/20k/200k/2m/200M C 10uF dB -10dB ~ +22dB (for 10VAC) ~+62dB hFE 1000 atX10	25																						
39.	Bread Boards	<table><tr><td>Family</td><td>Solderless Breadboards</td></tr><tr><td>Type</td><td>Terminal Strip (No Frame)</td></tr><tr><td>Number of Terminal Strips</td><td>1</td></tr><tr><td>Number of Distribution Buses</td><td>2</td></tr><tr><td>Number of Tie Points (Total)</td><td>640</td></tr><tr><td>Number of 5-Tie Point Terminals</td><td>128</td></tr><tr><td>Number of Binding Posts</td><td>-</td></tr><tr><td>DIP Capacity</td><td>-</td></tr><tr><td>Size / Dimension</td><td>6.875" L x 2.563" W (174.6mm x 65.1mm)</td></tr><tr><td>Includes</td><td>-</td></tr><tr><td>Wire Gauge</td><td>22 AWG</td></tr></table>	Family	Solderless Breadboards	Type	Terminal Strip (No Frame)	Number of Terminal Strips	1	Number of Distribution Buses	2	Number of Tie Points (Total)	640	Number of 5-Tie Point Terminals	128	Number of Binding Posts	-	DIP Capacity	-	Size / Dimension	6.875" L x 2.563" W (174.6mm x 65.1mm)	Includes	-	Wire Gauge	22 AWG	25
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Includes	-																								
Wire Gauge	22 AWG																								
40.	Wire Stripper	Processing cross section0.08-6mm ² Max. outside diameter..... 6mm	5																						
41.	Soldering Iron	(30 Watt) Imported	5																						

Issued by: Prof. Dr. Saeed Ahmad
Project Director (SAUG)



**UNIVERSITY OF ENGINEERING AND TECHNOLOGY TAXILA
(STRENGTHENING AND UP-GRADATION OF UNIVERSITY OF
ENGINEERING & TECHNOLOGY AND ITS SUB-CAMPUS)**

Phone: 92-51-9047633 Fax: 92-51-9047797

Tender Notice

1. The University of Engineering & Technology, Taxila invites bids for purchase of Laboratory Equipment on CNF and Pak rupees basis for Department of Environmental Engineering, Industrial Engineering, Electrical Engineering, Mechanical Engineering and Electronics & Mechatronics Engineering from authorized distributors / sales agents. The details of equipment including specifications are provided in the Tender document(s).
2. The Tender Document(s) can be purchased on Payment of Rs. 5000/- in Habib Bank, Branch UET Taxila on prescribed Challan Form.
3. Tender Document(s) can also be downloaded from official website of UET, Taxila (www.uettaxila.edu.pk) or can be obtained from the office address below. The Bidders may visit the office of Project Director (SAUG) during working hours of University.
4. The Bids (Technical & Financial) on single stage two envelope basis should reach the undersigned not later than **11:00 am on 03.02.2014**. The bids will be opened on same date at 12:00 noon in the presence of bidders.

Prof. Dr. Saeed Ahmad
Project Director (SAUG)
University of Engineering & Technology, Taxila
Phone: (051) 9047633 Fax: (051) 9047797
Email: dr_sahmad@yahoo.com

TENDER DOCUMENT

*TENDER DOCUMENT FOR STRENGTHENING AND UP-GRADATION OF
LABS OF ELECTRICAL & MECHATRONICS ENGINEERING (CHAKWAL
CAMPUS)*

PAK RUPEES / CNF BASIS

TENDER NO. SAUG/CHAKWAL/2014



**STRENGTHENING AND UP-GRADATION OF
UNIVERSITY OF ENGINEERING & TECHNOLOGY
AND ITS SUB-CAMPUS**

UNIVERSITY OF ENGINEERING AND TECHNOLOGY TAXILA

Tel: 051 9047633 Fax: 051 9047797



**UNIVERSITY OF ENGINEERING AND TECHNOLOGY TAXILA
(STRENGTHENING AND UP-GRADATION OF UNIVERSITY OF
ENGINEERING & TECHNOLOGY AND ITS SUB-CAMPUS)**

Phone: 92-51-9047633 Fax: 92-51-9047797

**TENDER DOCUMENT FOR STRENGTHENING AND UP-GRADATION OF LABS AT
SUB- CAMPUS CHAKWAL (ELECTRONICS & MECHTRONICS ENGINEERING) on
CNF / PAK RUPEES BASIS**

Part (1): Terms and Conditions

1. Please follow the given terms;
 - a. **The firm / bidder shall clearly provide the proof of Registration for GST / NTN on their printed letterheads.**
 - b. **Tender No., date & timing of opening should be clearly mentioned on the top of envelopes.**
 - c. **Submit your offer for each tender in separate envelopes.**
 - d. **No tender documents will be received after the closing date / time.**
 - e. **Bids will be submitted on "Single Stage two Envelopes" basis.**
 - f. **In case of closed/forced holidays, tender opening time/date will be considered as the next working day.**
 - g. **Price should be quoted with all accessories**
 - h. **It is the responsibility of the supplier to provide all necessary equipment with the basic unit to run the system.**
2. Certificate showing that the firm has not been blacklisted or debarred by any Government Department.
3. Preference will be given to those firms which have their Head Office/Branch Office and/or Technical Support/Maintenance Facilities at Rawalpindi, Islamabad or Wah Cantt.
4. The specifications of the equipment to be supplied are attached (**Part 3 of Tender Document**).
5. The material must be according to specifications.
6. The supplier is bound to replace within 15 days all or any part of the equipment found defective during initial inspection by Project Committee. The supplier shall provide replacement of defective items / parts to the purchaser at UET, Taxila main store. The supplier shall also remove defective parts / item(s) from Main Store UET Taxila without claiming any additional Cost.
7. Offers shall remain valid for 120 days from the date of opening. The bidders shall quote their prices inclusive of all duties / Taxes / Packing / Petrol / Transportation / Installation / Demonstration etc and all other expenses on delivery to consignee at UET Taxila premises.

8. The sealed bids complete in all respect must reach in the office of the undersigned along with earnest money (2%) in shape of **CDR to be attached with technical offer**.
9. The sealed tenders, complete in all respects, must reach the undersigned at the time and date notified in the advertisement. **Late receipts shall not be entertained**, whatsoever the reason may be.
10. The tenders shall be opened in the office of the undersigned at the notified date and time. The bidders or their representatives can be present if they so desire.
11. Only those tenders will be entertained which are absolutely clear / unambiguous and legible. Any unavoidable cutting / overwriting must be signed and initialed.
12. The offered items must be brand new and free from any manufacturing defect.
13. The University reserves the rights to inspect the working facilities and equipment of the supplier at any stage.
14. The items shall be supplied **within 45-days** of issuance of the Supply Orders.
15. A penalty of **0.5%** of the total cost or order can be imposed per day for delay on the part of the bidder up to maximum 20 days.
16. The University has the right to increase or decrease the quantum of work according to available budget. Prices must be inclusive of all freight, taxes and duties (if any).
17. In case of failure in the supply, the Project Purchase Committee will have the right to cancel the supply order and forfeit the earnest money and blacklisting.
18. In case of delay, Project Purchase Committee can provide extension in the date of supply to any bidder(s) provided valid reasons are given.
19. The payment shall be subject to satisfactory inspection report from the concerned evaluation committee and 10% of the total billed amount shall be retained by the University for a Period **Not less than Six Months**, as Security.
20. The bidders shall submit separately Technical and financial proposals for qualifying status.
21. Following documents must be attached with the technical proposal.

i.	Last income tax paid certificate (FBR)	vii.	GST / NTN valid Certificates
ii.	Last GST paid certificate (FBR)	viii.	No black listing on stamp paper
iii.	Client List	ix.	Bank Statement (worth 2 Million)
iv.	Work Experience	x.	Company profile
v.	Relevant Experience	xi.	Letter of appreciation from previous clients
vi.	Detail specification of equipment with literature	xii.	Warranty / Guarantee Letter

22. The winning bidder shall have to sign a prescribed agreement on the Stamp Paper of prescribed value (i.e. 0.25% of the total ordered cost) duly stamped from notary public.

23. Payment will be as per under university rule after receipt of the supply and satisfactory inspection.
24. The Project Purchase Committee shall have the powers to reject, in part or as a whole, any one or all the quotations without assigning any reason thereof as per PPRA rules.
25. The Tender / Relevant documents can also be downloaded from official website www.uettaxila.edu.pk of UET, Taxila or can be obtained from the office addressed below. For further queries regarding tender, bidder(s) are encouraged to contact / visit undersigned in the university working hours. Tender Notice can also be seen on website www.ppra.punjab.gov.pk.
26. Tender submitted without challan form (Tender Fee) & earnest money CDR can be rejected at the time of opening of tender. Earnest money & challan form will be submitted against each tender separately.
27. The procuring agency "may reject all bids or proposals at any time prior to the acceptance of a bid or proposal. The procuring agency shall upon request communicate to any supplier or contractor who submitted a bid or proposal, the grounds for its rejection of all bids or proposals, but is not required to justify those grounds".
28. Tender will be opened in Conference Hall, Admin Block UET Taxila at **12:00 noon on 03.02.2014**.

Prof. Dr. Saeed Ahmad
Project Director (SAUG)
University of Engineering & Technology, Taxila
Email: dr_sahmad@yahoo.com



UNIVERSITY OF ENGINEERING AND TECHNOLOGY TAXILA
(STRENGTHENING AND UP-GRADATION OF UNIVERSITY OF
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Phone: 92-51-9047633 Fax: 92-51-9047797

TENDER NO. SAUG/Chakwal/2014

***PART (2): SCHEDULE OF REQUIREMENTS FOR THE PURCHASE OF LAB EQUIPMENT FOR
ELECTRONICS & MECHATRONICS ENGINEERING (CHAKWAL CAMPUS)***

The delivery of services and supply will be made in 45 days after issuance of Purchase Order (without penalty) and with the prescribed penalty as per following schedule of requirement:

MODE OF PENALTY	NO OF DAYS	TOTAL DELIVERY PERIOD
Without Penalty	45 days	45 days
With Penalty @ 0.5 % per day on the delayed completion of task	50 days (5 days after 45 days)	50 days (45 + 05)

PRICE SCHEDULE FOR THE EQUIPMENT ON PAK RUPEES BASIS:

Name of Bidder: _____

The Equipment to be completed is tabulated as under:

S. No.	Item (s)	Qty	Unit price (Rs)	GST (Rs) 17%	Total Cost including GST(Rs)	Bid Security (2% of the Total Cost)
1.						
2.						
3.						

PRICE SCHEDULE FOR THE EQUIPMENT ON CNF BASIS:

Name of Bidder: _____

S. No.	Item(s)	Qty	Currency Type	Unit Cost (CNF)	Total Cost	Bid Security (2% of the Total Cost)
1.						
2.						
3.						

Signature of the Bidder: _____ Stamp of Bidder: _____

Note: In case of discrepancy between unit price and total, the unit price shall prevail.

Issued by: Prof. Dr. Saeed Ahmad
Project Director (SAUG)



UNIVERSITY OF ENGINEERING AND TECHNOLOGY TAXILA
(STRENGTHENING AND UP-GRADATION OF UNIVERSITY OF
ENGINEERING & TECHNOLOGY AND ITS SUB-CAMPUS)

Phone: 92-51-9047633 Fax: 92-51-9047797

Tender Document
Part (3): Specifications

Sr. No.	Nomenclature / Specification	Quantity
HEAT TRANSFER LAB		
1.	HEAT TRANSFER THROUGH COMPOSITE WALL Slab material & slab size is given as under; Cast iron: 250 mm dia. & 20mm thick. Bakelite: 250mm dia.& 15 mm thick Press wood:250 mm dia. & 15 mm thick Heater: nichrome wire	2
2.	SHELL & TUBE HEATER EXCHANGER Volume :0.06 m ³ Gross weight 5 kg Height 0.19m Width 0.43m Depth 0.39m with all accessories to make it functional.	2
3.	COMPUTER CONTROLLED HEAT EXCHANGER SERVICE Module Volume:0.33m ³ Gross Weight 33 kg Height:0.45m(service unit only) Width: 1.0m Dept: 0.5m	2
4.	FORCED CONVECTION APPARATUS Test Section: horizontal, externally heated Diameter: 28mm (approx.) Length:400mm(approx.) Blower: fhp of standard make. Heater : nichrome wire Air flow measurement: orifice meter & manometer with all accessories to make it functional.	2

Sr. No.	Nomenclature / Specification	Quantity
5.	EMISSION MEASUREMENT APPARATUS Test plate diameter :160 mm Black plate dia. 160 mm Heater (2 Nos.) nichrome wire heater.(one each for test plate & black plate)	2
6.	HEAT TRANSFER FROM PIN FIN Fin: pin type Material : brass Size: 12.5 mm (approx.) 15 cm. Long (approx.) Duct: made of MS Fan: standard make. Heater : band type , nichrome wire	2
MECHANICS LAB		
7.	WORM & WHEEL APPARATUS <ul style="list-style-type: none"> 5N 'EFFORT' hanger and 1N 'LOAD' Hanger Wall mounted Effort pulley effective diameter Ø97mm Load pulley effective diameter Ø97mm Worm and Wheel centre distance 65mm To mount at least 1500mm above floor Weights set Comprehensive instruction manual provided 	1
8.	FLYWHEEL APPARATUS <ul style="list-style-type: none"> Large steel flywheel with mark on perimeter Steel flywheel Ø250mm x 30mm thick Cord wrapped around shaft of flywheel Hanger locates onto cord and pulls flywheel around when calibrated weights applied to hanger Pointer on periphery of flywheel to record rotations Stopwatch supplied Comprehensive instruction manual provided 	1
9.	GYROSCOPE <ul style="list-style-type: none"> To have independent dual axis rotation for gyroscopic disc and gyroscope assembly To have dual independent speed control of axis LCD display of speed To have sliding weight along horizontal axis To have transparent safety cover provides visibility of experiment and safety Must have automatic power cut-off with removal of cover switch Comprehensive instruction manual 	1
10.	GOVERNOR APPARATUS <ul style="list-style-type: none"> To be bench top unit to study various governors and determine their characteristic and adjustment curves 3 different governors: Porter, Proell, Hartnell Governor mass adjusted by weights To have motor driven axis with speed control and digital display To have quick and easy fitting and removal of governors Rotating parts to be completely covered by a transparent safety cover Micro switch operated power cut-off Comprehensive instruction manual 	1
11.	WINCH <ul style="list-style-type: none"> 500Kg lifting capacity Winch with winding drum Ø73mm connected to a 62-tooth spur gear wheel by a shear pin 	1

Sr. No.	Nomenclature / Specification	Quantity
	<ul style="list-style-type: none"> 8 tooth pinion Pawl and ratchet wheel Ø172mm 'EFFORT' pulley Ø4mm cord The winch is supplied with a substitute cable in the form of a heavy-duty Ø8mm nylon rope 5N 'LOAD' hanger 2N 'EFFORT' hanger Comprehensive instruction manual provided 	
12.	ANGULAR MOMENTUM CONSERVATION <ul style="list-style-type: none"> Bench top apparatus for clearly demonstrating the basic concepts of conservation of angular momentum To comprise of a bench mounted vertical board with a rotating arm, and two sliding weights The weights can be moved radially along the rotating arm by a cord The arm is spun manually Comprehensive technical manual 	1
13.	FORCE TRIANGLE APPARATUS <ul style="list-style-type: none"> Resolution of three static, co-planar forces; determination of triangle of forces and verification of closed triangle when in equilibrium; finding resultant force from 2 known forces. The simple, bench mounted apparatus consists of a work surface, 3 variable position pulleys, a ring with 3 cords, 3 weight hangers. The work surface features a central spigot and a central in-built protractor scale. An instruction manual for student and lecturer provided. Set of weights. 	1
14.	MOMENT OF INERTIA APPARATUS <ul style="list-style-type: none"> To be a table top apparatus for determining centrifugal forces of angular motion and angular momentum Solid and sturdy base plate with integral feet and level indicator To have rotating plate accelerated by hangers and weights Hollow cylinder and bar can be attached to plate to vary mass Centrifugal force attachment Speed of rotating plate monitored Data acquisition software and PC Comprehensive technical manual 	1
15.	CENTRIFUGAL FORCE APPARATUS <ul style="list-style-type: none"> To verify that centrifugal force on a rotating mass is proportional to the mass, the radius of gyration and the square of the speed To consists of a built in variable speed drive, rotation assembly; digital tachometer and digital force display To be supplied with 6 masses, of 100g each Sliding adjustment of masses Rotating arm fully guarded Transparent safety cover An instruction manual for student and lecturer provided All tools and accessories supplied 	1
MECHATRONICS SYSTEM DESIGN LAB		
16.	HUMANOID ROBOTIC KITS <ul style="list-style-type: none"> CM-510(Main Controller-ATMEGA 2561)X1pc. 	2

Sr. No.	Nomenclature / Specification	Quantity
	<ul style="list-style-type: none"> AX-12A(Robot Exclusive Actuator,Dynamixel) X8pcs. AX-18(Robot Exclusive Actuator,Dynamixel)X10pcs. Gyro Sensor (2Axis) X 1pc. Absolute Distance Measurement Sensor X1pc. RC-100Z(Remote Controller,Zigbee included)X1pc. Rechargeable Battery(11V,Li-Po, 1000mA/PCM)X1pc. Balance Battery Charger X1pc. USB 2 Dynamixel Humanoid Aluminum Frame Full Set Gripper Frame Set Quick Start (16DOF humanoid assembly manual included) Wrench, Screw Driver, Wrench Bolt, Cable Holder Roboplus Software CD(Window XP/2000/Vista 32 bit) Aluminum Trunk <p>Or equivalent</p>	
17.	<p>PC WEBCAMS</p> <ul style="list-style-type: none"> Quick 5 MP webcam w/720P HD video Up to 5.0 MP Image Capture HD Widescreen Video Recording Face Tracking system Software Built-in Snapshot & Dual stereo Microphone Desktop Stand and Gear Head between cam and stand for adjustment An Available USB Port to connect with PC <p>Or equivalent</p>	10
18.	<p>TWIN ROTOR SYSTEM</p> <ul style="list-style-type: none"> Twin Rotor MIMO 33-007-PCI Specifications: Power requirements: Line voltage: 200/250 V or 100/125 V, 50 or 60 Hz. Consumption: 100 VA. Fuse: 4 A (110 V), 2 A (230 V). Weight and Dimensions: 80 cm (w) x 35 cm (d) x 75 cm (h), Weight: 11 kg. Tender Specification: A MATLAB™ controlled Twin Rotor system enabling control Over system dynamics, study and design of controllers. Ordering information: Order: Twin Rotor MIMO 33-007-PCI — System with MATLAB™ interface card and cable <p>or equivalent</p>	1
19.	<p>SERVO MECHANISM LABORATORY Prototype Machine</p>	1
20.	<p>ARM'S TRAINER KITS</p> <ul style="list-style-type: none"> Embest ATEBSAM7S Evaluation Board Hardware specification Dimensions: 100x100mm Working temperature: -45~85 Celsius Processor: AT91SAM7S64 with integrated 64Kbyte FLASH and a 16Kbyte high-speed on-chip SRAM Power input: +5.0V 1 USB Device Port 1 RS232 serial port 1 serial-port debugging interface(DBGU) 1 SPI interface with a circumscribed 8-seg nixie tube TWI bus (Two-wire interface bus which is connected to an EEPROM chip AT24C02) 1 PWM interface with a circumscribed buzzer 1 ADC controller (the input analog signals gained through a voltage regulator) I/O ports all extended 	5

Sr. No.	Nomenclature / Specification	Quantity
	<ul style="list-style-type: none"> 1 reset button and 4 user's input buttons LCD interface (be able to connect character LCD) 20 pin standard JTAG interface Or equivalent	
21.	AVR TRAINER KITS STK200 AVR Board <ul style="list-style-type: none"> Separate sockets for different AVR microcontrollers simplifies use Easy access to all microcontroller ports Peripheral support including ADC and UART LCD interface modules are available separately 3.3V/5V operation Brownout circuitry External Flash RAM and Serial EEPROM support Switches and LEDs Manual on CD ATmega16 AVR device, 40-pin Schematics Socket support for ATtiny26 and new ATmega devices Switches and LEDs can be moved to different ports Improved ADC support Sockets for Flash RAM (AT29256) and Address latch 2-wire EEPROM socket (24Cxxx) New Port B headers to correctly route signals from smaller devices Clock/Port Pin jumpers on smaller sockets to free I/O pin when running Compatible with existing STK200 code and applications Or equivalent	5
22.	CNC LATHE MACHINE Model 4400 <ul style="list-style-type: none"> Swing over bed 3.50" (90 mm) Swing over carriage 1.75" (45 mm) Distance between centers 17.00" (430 mm) Hole through spindle .405" (10 mm) Spindle nose thread 3/4"-16 T.P.I . Spindle nose taper #1 Morse Effective crossslide travel* 3.25" (83 mm) Taper of tailstock spindle #0 Morse. Protractor graduations 0° to 45° by 5° Handwheel graduations .001" (.01 mm) Length overall 32.25" (820 mm) Width overall 8.75" (220 mm) Height overall 8" (200 mm) Shipping weight 30 lb. (13.6 kg) Motor/Speed Control 90 Volts DC with electronic speed control that accepts any incoming current from 100VAC to 240 VAC, 50 Hz or 60 Hz. Click here for more detailed motor and other machine specifications. Spindle speed range 70-2800 RPM continuously variable by electronic speed control Or Equivalent	1
23.	CNC MILLING MACHINE Model 5400 <ul style="list-style-type: none"> Max clearance, table to spindle 8.00" (203 mm) Throat (without headstock spacer) 2.25" (50 mm) Throat (with headstock spacer block) Included, 3.50" (89 mm) Travel, "X" Axis 8.68" (228 mm) (9" w/ stop screw removed) Travel, "Y" Axis 5.00" (127 mm) Travel, "Z" Axis 6.25" (159 mm). Hole through spindle .405" (10 mm) 	1

Sr. No.	Nomenclature / Specification	Quantity
	<ul style="list-style-type: none"> ▪ Spindle nose thread 3/4-16 T.P.I. ▪ Spindle taper #1 Morse. ▪ Handwheel graduations .001" (.01 mm) ▪ Width overall* 15.00" (381 mm) ▪ Depth overall* 14.00" (356 mm) ▪ Height overall* 20.75" (527 mm) ▪ Table size 2.75" x 13.00" (70 x 330 mm) ▪ Hold down provision 2 "T" Slots ▪ Shipping weight 36 lb. (16.3 kg) ▪ Movements in addition to X-, Y- and Z-axes Headstock rotation 90° left/right ▪ Motor/Speed Control 90 Volts DC with electronic speed control that accepts any incoming current from 100VAC to 240 VAC, 50 Hz or 60 Hz. Click here for more detailed motor and other machine specifications. ▪ Spindle speed range 70-2800 RPM continuously variable by electronic speed control <p>Or Equivalent</p>	
24.	<p>VARIOUS TRANSDUCERS AND SENSORS</p> <ul style="list-style-type: none"> ▪ Color sensor TCF230 color sensor version 1.0 <p>Or equivalent</p> <ul style="list-style-type: none"> ▪ Ultrasonic sensor SRF005 ULTRASONIC RANGE SENSOR Voltage - 5V Current - 30mA Typ. 50mA Max. Frequency - 40KHz Max Range - 3 m Min Range - 3 cm Sensitivity - Detect 3cm diameter broom handle at > 3 m Input Trigger - 10uS Min. TTL level pulse Echo Pulse - Positive TTL level signal, width proportional to range. Small Size - 43mm x 20mm x 17mm height <p>Or equivalent</p> <ul style="list-style-type: none"> ▪ Thermocouple sensor Chromel – constantan (Type E) sensitivity of 80 µV /°C inaccuracy of ± 0.5% Temperature range 200°C up to 900°C <p>Or equivalent</p> <ul style="list-style-type: none"> ▪ RTDs PT-100 <p>Or equivalent</p> <ul style="list-style-type: none"> ▪ Pressure sensor Diaphragm absolute pressure range up to 50 bar gauge pressure range up to 2000 bar diaphragm displacement is 0.1 mm <p>Or equivalent</p>	1 Set
25.	<p>ACTUATORS</p> <ul style="list-style-type: none"> ▪ Cylinders – Single acting cylinder ▪ Double acting cylinder ▪ SOV's Two way, 220V, 1/2" diameter ▪ Pumps 12V, 24V ▪ Servo Motors 12V, 40RPM, 36Watt, encoder with resolution 1 ▪ Stepper Motors 12V and with 5° step angle <p>Or Equivalent</p>	1 Set
THERMO FLUID LAB		
26.	BASIC HYDRAULIC BENCH Pump:	1

Sr. No.	Nomenclature / Specification	Quantity
	<ul style="list-style-type: none"> Max. flow rate: 230L/min Max. head: 11m Supply tank: capacity: 180L <p>Volumetric tank :</p> <ul style="list-style-type: none"> for high flow rate: 40L for low flow rate: 10L <p>Dimensions and Weight:</p> <ul style="list-style-type: none"> L x W x H : 1220 x 760 x 1200 mm Empty weight : approx. 125 kg <p>Connections:</p> <ul style="list-style-type: none"> 230V, 50/60Hz, 1 phase or 120V, 60Hz, 1 phase <p>Scope of Delivery:</p> <ul style="list-style-type: none"> 1 bench, completely assembled 1 stopwatch 1 graduated beaker 1 instruction manual 	
27.	<p>OSBORNE REYNOLDS' DEMONSTRATION APPARATUS</p> <ul style="list-style-type: none"> A-Fluid flow is controlled by a needle point globe valve. B-Supply includes stilling bed, hoses and dye. Water supply:- Up to 0.5 liters/sec maximum Shipping specification:- Volume: 1.2m³ Gross weight: 130kg Overall Dimensions:- Height: 1.48m Diameter: 0.61m 	1
28.	<p>HYDROSTATIC PRESSURE APPARATUS</p> <p>Dimensions and weights:</p> <ul style="list-style-type: none"> Nett: 1700 x 750 x 1700 mm; 120 kg Gross: 3.25 m³; 250 kg <p>Equipment include:-</p> <ul style="list-style-type: none"> Reservoir tank with hand pump Vernier hook gauge Fluid level apparatus: 4 off interconnected glass tubes of varying cross sections and shapes Pressure gauge: Bourdon type with visible mechanism and dead weight calibrator Manometers: 2 off U-tubes Capillarity apparatus: glass tubes of various bores, glass plates with plastic shims for various separations Calibrated hydrometer Measuring cylinder Graduated beaker Timer Floating rectangular pontoon with adjustable centre of gravity Specific gravity bottle Eureka can Air pump Three-beam balance Centre of pressure tank and balance Archimedes' mass Various ball bearings Single limb barometer 	1
29.	<p>BERNOULLI'S DEMONSTRATION APPARATUS</p> <p>Manometer range: 0 to 300mm</p> <p>Number of manometer tubes: 8</p> <p>Throat diameter: 10.0mm</p>	1

Sr. No.	Nomenclature / Specification	Quantity
	Upstream diameter: 25.0mm Upstream taper: 14° Downstream taper: 21°	
30.	ORIFICE AND FREE JET VELOCITY APPARATUS <ul style="list-style-type: none"> Orifice diameters: 3.0mm and 6.0mm Jet trajectory probes: 8 Max. constant head: 410mm 	1
31.	ORIFICE DISCHARGE APPARATUS <ul style="list-style-type: none"> Net dimensions: 720 mm x 520 mm x 470 mm Packed dimensions and weight: 0.18 m3 and 15 kg Maximum head: 365 mm Maximum flow rate: Nominally 13 liters per minute Include triangular orifice dimensions: Each side nominally 12.1mm Square orifice dimensions: Each side 9 mm Orifice material: Aluminum 	1
32.	FREE AND FORCED VORTICES APPARATUS <ul style="list-style-type: none"> Tank diameter: 245mm Height to overflow point: 180mm Orifice diameters: 8, 16 and 24mm Forced vortex measuring probes Distance from centre: 0, 30, 50, 70, 90 and 110 mm Pitot tubes having measuring point (nose) at: 15, 25 and 30 mm radius Inlet tubes: 9 and 12.5mm diameter 	1
33.	COMPRESSIBLE FLOW BENCH Electrical supply: <ul style="list-style-type: none"> A: 220-240V/1ph/50Hz B: 120V/1ph/60Hz Overall Dimensions: <ul style="list-style-type: none"> Length: 1.75m Width: 0.72m Height: 0.62m Shipping Specification: Gross weight: 220kg Volume: 1.4m3 	1
34.	VENTURE METER <ul style="list-style-type: none"> A horizontal venture tube, Plexiglas cylinder capacity approx 13.5 liter Diameter of discharge nozzles: 1x8mm, 1x4mm. 	1
35.	PELTON WHEEL TURBINE <ul style="list-style-type: none"> Speed range: 0 to 2000 r.p.m. Brake power: 10 Watts Pressure gauge range: 0 to 25m H₂O Force balance range: 0 to 10N x 0.1N Number of Pelton buckets: 16 Diameter of Pelton wheel: 123mm 	1
36.	CENTRIFUGAL PUMP MODULE <ul style="list-style-type: none"> Pump: centrifugal type Max. head 21m H₂O Max. flow 1.35 liters/sec Motor rating: 0.36kW Speed controller: PWM inverter Speed range: 0 to 1500 rpm Pressure gauge range: 0 to 60m H₂O Compound gauge range: (-10 to + 45m H₂O) 	1
37.	AXIAL FLOW PUMP MODULE <ul style="list-style-type: none"> Nett Weight: 165 kg (without water) 	1

Sr. No.	Nomenclature / Specification	Quantity
	<ul style="list-style-type: none"> Nominal Maximum Pump Flow: 12 L.s⁻¹ Nominal Maximum Pump Head: 3.5 m H₂O (35 kPa) Instruments and Measurements: <ul style="list-style-type: none"> Digital Pressure Display to show pressures at the pump and across the nozzle. You use the pressures across the nozzle to calculate the flow. Note - the Universal Dynamometer (MFP100) provides electrical power for the Digital Pressure Display Torque, speed and power: Measured and displayed digitally by the Universal Dynamometer (MFP100) 	
38.	<p>SINGLE CYLINDER TWO STROKE PETROL ENGINE TEST RIG</p> <p>Engine 150 cc Horizontal cylinders, air cooled petrol engine developing 3 kw at 6000 rpm of blower.</p> <p>Coupled to engine, with rope wound around the drum. Spring balance for loading the engine. Water cooling arrangement for the drum.</p> <p>Air Intake tank of 250 X 250 X 250 mm.</p> <p>Fitted with orifice and water manometer.</p> <p>Calibrated burette with three-way cock assembly</p> <p>For cutting off the fuel supply from the tank.</p> <p>Water cooled exhaust gas calorimeter, shell And Calorimeter- coil type to study the heat lost to exhaust gases.</p> <p>Multi channel digital temperature indicator for measuring inlet and outlet temperatures of exhaust gases and water. A detailed technical manual accompanies the unit.</p> <p>Water supply of about 10 lit/min.</p> <p>Tachometer, 0 9999 rpm. Contact type.</p> <p>(A) With Rope Brake Dynamometer</p> <p>(B) With Electrical Dynamometer</p>	1
39.	<p>SINGLE CYLINDER FOUR STROKE PETROL ENGINE TEST RIG</p> <p>New Honda engine Single Cylinder four stroke Air Cooled Petrol Engine to develop 3 HP @ 3600 RPM</p> <p>Main parts of the test rig, Welded steel base plate, complete with Mechanical Brake or A.C. Alternator or D.C. Generator or Eddy Current Dynamometer, Drive coupling and with safety guard, anti vibration mounting, along the following instrumentation</p> <ol style="list-style-type: none"> 1). 'U' tube manometer for air flow rate 2). Burette for fuel flow rate 3). Digital Temperature Indicator-Multi point indicator with thermocouples. 4). Digital Voltmeter, Ammeter 	1
40.	<p>UNIT FOR DEMONSTRATING BOYLE'S LAW</p> <ul style="list-style-type: none"> Lxwxh 750x400x700mm, 25kg Measuring cylinder containing test gas, manometer and scale Compressor, can also be used as vacuum pump Plexiglas cylinder D 133mm, height 330mm 230V, 50/60Hz, 1 ph. or 120V, 60Hz, 1 ph. 	1
41.	<p>SHELL AND TUBE HEAT EXCHANGER</p> <p>LxWxH : 400x230x110mm, weight approx 7kg, Heat exchanger area=20000mm²</p>	1

Sr. No.	Nomenclature / Specification	Quantity
42.	SINGLE SOLAR COLLECTOR SYSTEM Collector: power 2kW, absorber surface: 2.5m ² , Nominal transfer flow rate: 50 - 300ltr/h, Operating pressure: 3.5 - 6 bar, safety valve: 6bar plates heat exchanger: 3kW, 10plates Measuring ranges: water meter: 1.5m ³ /h; Flow rate: 40...440ltr/h; temperature: 20 - 120°C L x w x h : 2000 x 850 x 2145 mm Weight : approx. 240 kg	1
43.	SINGLE STAGE COMPRESSOR MODULE operating pressure: 8bar Max. pressure: 10bar intake capacity: 150L/min at 8bar Safety valve blow off pressure: 10bar Pressure vessel: 16bar, capacity: 10L Intake vessel: 20L, 2 manometers: -1 - 1.5bar / 0 – 16 bar Dimensions and Weight L x w x h : 910 x 830 x 1520 mm Weight : approx 80 kg	1
44.	CALORIMETER APPARATUS With temperature sensors (Rota meter) PC based control , connection of engine and calorimeter via exhaust hose, 220 volt, 50Hz.	1
45.	HEAT TRANSFER (FORCED CONVECTION IN AN AIR FLOW) Nett Dimensions and Weight (when assembled with anemometer on duct) 850 mm wide x 550 mm front to back x 1200 mm high and approximately 30 kg (including the three heat transfer surfaces) Electrical Supply: 220 to 240 VAC 50 Hz to 60 Hz at 0.6 A	1
ASIC AND SIGNAL PROCESSING LAB		
46.	FPGA SPARTAN Spartan-6 FPGA SP605 Evaluation Kit or Latest FPGA kits	25
47.	MENTOR GRAPHICS IC DESIGN SUIT Complete Mentor Graphics IC design Suit, 5 Years License for 30Users	1
48.	VERTEX KIT Xilinx Virtex-7 FPGA VC707 Evaluation Kit or Avnet Spartan-6 FPGA Industrial Video Processing Kit	2
49.	ANALOG DEVICES BF 537 OR LATEST DSP KIT OR EQUIVALENT Development Boards & Kits - TMS320 TMS320C6416 DSP Starter Kit (DSK) Development Boards & Kits - TMS320 TMS320C6713 DSP Starter Kit (DSK)	10

Sr. No.	Nomenclature / Specification	Quantity
50.	ANALOG DEVICES MULTIMEDIA EXTENDER CARDS OR EQUIVALENT Multimedia Extender Cards for TMS320	4
51.	LAN EXTENDER CARDS OR EQUIVALENT LAN Extender Cards for TM 320	4
52.	ANALOG DEVICES BF 561 OR EQUIVALENT Analog Devices BF 561 DSP Processor Evaluation Kit	5
53.	POWER SUPPLIES Output Ratings Range 1: 0 to 15 V, 7 A Range 2: 0 to 30 V, 4 A	10
54.	OSCILLOSCOPE 1000MHZ Digital Oscilloscope 1000 MHz bandwidth, 4 analog channels, 2 GSa/s sample rate half channel, 1 GSa/s each channel, 20 kpts memory half channel, 10 kpts each channel	10
55.	PROGRAMMABLE FUNCTION GENERATOR Frequency and amplitude coupling, differential or combined outputs, 30 MHz, dual-channel mode, sine, square, pulse bandwidth cover more applications, 250 MSa/s, 16-bit sampling rate for higher time resolution arbitrary waveforms, 16 MSa/channel arbitrary waveform memory option, USB and LAN (LXI-C) standard	10
56.	SOLDERING STATIONS Auto Sleep and Wake Functions Digital Offset Feature Programmable Sleep Function Maintains a constant set temperature within 1 Centigrade, when the set and the value is reached, 24 volt output to prevent circuit board damage, 60 Watt iron, 220 volts	10
57.	DIGITAL MULTIMETERS DC Voltage 400mV/4V/40V/400V/1000 V AC Voltage 4V/40V/400V/750V DC Current 400mA/4000mA/40mA/400mA/4A/10A AC Current 400mA/4000mA/40mA/400mA/4A/10A Resistance 400ohm/4kohm/40kohm/400kohm/4Mohm/40Mohm Capacitance 40microF/400microF Frequency 10Hz-10MHz	10
58.	SUN SOLARIS, SUN FIRE MACHINE Processor : Intel® Xeon® processor E7 or E5 family, (2 processors/ 24 cores) Clock Speed : 2.40 GHz Slots: Up to eight PCI expansion slots with optional PCI-X slot RAM : 300 GB, DIMM (DDR3) 256GB Hard Drive : 2TB-32TB SATA 3.5 inch hot-swap or simple-swap SAS/SATA HDDs Memory Speed : greater than 1866 MHz	1

Sr. No.	Nomenclature / Specification	Quantity
ELECTRIC MACHINES LAB		
59.	DIGITAL TORQUE AND POWER METER Prime mover/Dynamometer Permanent Magnet Direct Current Machine, Torque 0 to 3 N-m, rotation CW/CCW, Display: Torque/speed etc. Prime mover mechanical power 750 W, 0-150 V-DC, input current 6.5A, 0 to 2500 rpm Dynamometer 250W-750 W, 290-3000 rpm Digital Tachometer – direction of rotation: CW & CCW: speed range: 0.5 – 20,000 rpm; accuracy: 0.05% + 1 digit; resolution up to 999.9 rpm: 0.1 rpm; resolution up to 1000 rpm & above: 1 rpm; display 5 digits; memory hold time 5 minutes after measurement;	5
60.	DC MACHINE D.C Motor/Generator (Shunt, Series, Compound excitation); Output Power: (i) as motor 175 W (ii) as Generator 110 W; Armature/shunt field voltage: 220 V DC; Full load speed: 1500 rpm; Full load current: (i) as motor: 1.3 A (ii) as Generator: 0.5 A Power Supply - Power requirement 220/380 V – 50 Hz; INPUT: Line voltage 220/380 V, line current 10 A; Service installation 20 A, 3- ϕ , 5-wire, star connected including neutral & ground; OUTPUT: fixed AC 3- ϕ 220/380 V, 10 A; variable AC 3- ϕ 0-220/380 V, 3 A; variable DC 0-220 V, 5 A; fixed DC: 220 V, 1 A; low power AC: 24 V, 3 A; wall outlet included; power chord 3 meter	5
61.	INDUCTION MOTOR SLIP RING 3- ϕ wound rotor induction motor - 220/380 V – 50 Hz; output power 175 W; stator voltage 380 V (3- ϕ); rotor voltage 110/190 V (3- ϕ); full load speed 1240 rpm; full load current 0.53 A	5
62.	SYNCHRONOUS MACHINE 3- ϕ Synchronous Motor/Generator 220/380 V – 50 Hz; output power: (i) as motor 175 W (ii) as Generator 110 VA; stator voltage 380 V (3- ϕ); rotor voltage 220 V DC; speed 1500 rpm; full load current: (i) as motor: 0.36 A (ii) as Generator: 0.17 A Synchronizing module – For Synchronism between two ac generators, 220 V – 50 Hz; Rating: each phase 440 V, 1 A AC; light bulb 130 V, 2.6 W; circuit breaker 1A Timing belt – pitch 9.5 mm; pitch length 819 mm; no. of teeth: 86;	5
63.	INDUCTION MOTOR SQUIRREL CAGE 4-pole, 3-phase squirrel cage induction motor; 220/380 V – 50 Hz; output power 175 W; stator voltage 380 V (3- ϕ); full load speed 1395 rpm; full load current 0.48 A	5
64.	UNIVERSAL MOTOR Universal motor - 220 V AC/DC; output power : 175 W, full load speed 1500 rpm; full load current 1.4 A	5
65.	RELUCTANCE MOTOR 3- ϕ synchronous reluctance motor - output power 175 W; stator voltage 220 (1- ϕ) /380 V (3- ϕ); 50 HZ, full load speed 1500 rpm; full load current 1.05 A	5

Sr. No.	Nomenclature / Specification	Quantity
66.	STAR DELTA SWITCH 220/380 V - 50 Hz; 16 A	5
67.	REVERSE SWITCH 220/380 V – 50 Hz;16 A	5
68.	MOBILE MOTOR/GENERATOR UNIT Fixed/Mobile workstation to house different lab modules. It is to include three rows of compartments; has front-mounted push levers which allow different modules on a row to be easily removed; two safety padlocked bars on the front to prevent students from removing modules during lab exercises. Storage cabinet – required to have five shelves, each of which can accommodate different modules, and stainless steel rails to guide the modules on the storage shelves. Connection Leads – cross section 2.5 mm ² ; rated current 32 A; rated voltage 600 V; 2 - mm safety banana plug leads; 15,30,45,60 cm 4 - mm safety banana plug leads; 30,60,90,120,150 cm 3-φ cables with 4 - mm safety banana plug leads (4 wires & 3 wires) Shielded feedback cable with 2 mm banana plug leads (5 wires),Lead holder, coupling & alignment tool, shims, mounting plate, safety guard	5
69.	ASYNCHRONOUS MOTOR, 3-PHASE DEMONSTRATION SET 4-pole, 3-phase squirrel cage induction motor; 220/380 V – 50 Hz; output power 175 W; stator voltage 380 V (3-φ); full load speed 1395 rpm; full load current 0.48 A; intended to be used for demonstration purposes.	5
70.	LOAD RESISTOR, LOAD CAPACITOR, LOAD INDUCTOR Resistive load - Power requirement 220/380 V – 50 Hz; three groups of three resistors; 1100/2200/4400 Ω; nominal voltage 220 V AC/DC; accuracy ± 5%; Load at nominal voltage: (i) power 11-77 W (ii) current 0.05-0.35 A (iii) no. of steps: 7 of equal increment (iv) current increment: 0.05 A Inductive load - Power requirement 220/380 V – 50 Hz; three groups of three inductors; inductance (group) 3.5/7/14 H; reactance (group)1100/2200/4400 Ω; nominal voltage 220 V – 50Hz; accuracy ± 5%; Load at nominal voltage: (i) reactive power 11-77 VAR (ii) current 0.05-0.35 A (iii) no. of steps: 7 of equal increment (iv) current increment: 0.05 A Capacitive Load - Power requirement 220/380 V – 50 Hz; three groups of three capacitors; capacitance (group) 0.72/1.45/2.89 μF; reactance (group)1100/2200/4400 Ω; nominal voltage 220 V – 50Hz; accuracy ± 5%; Load at nominal voltage: (i) reactive power 11-77 VAR (ii) current 0.05-0.35 A (iii) no. of steps: 7 of equal increment (iv) current increment: 0.05 A	5 each
71.	AMMETER, VOLTMETER, WATTMETER Ammeter – measuring range 20-0-20 A; accuracy class 1.5 Voltmeter - measuring range AC/DC 0-50-250-500 V; accuracy class 2.5 Wattmeter – voltage range: 50-250-500 V AC/DC; current range: 5-10 A AC/DC;	5

Sr. No.	Nomenclature / Specification	Quantity
72.	MEASURING AND DATA ACQUISITION Computer based instrumentation / measurement & Network analyzer system: Includes following computer based instruments i) personal computer (with latest specs and software) ii) Metering (V, I, P, Q, S, η , pf, N, τ , ϕ etc) iii) Data table & graph iv) Oscilloscope v) phasor analyzer vi) Harmonic analyzer vii) Spectrum Analyzer viii) synchroscope function Data Acquisition & Control Interface – 220/380 V, 50 HZ, required having four insulated high level voltage inputs, four insulated high level current inputs, eight low level analog inputs, three digital inputs and a parallel digital output, torque, speed and mechanical power meters, torque input, speed input, synchronization input.	5

Issued by: Prof. Dr. Saeed Ahmad
Project Director (SAUG)



**UNIVERSITY OF ENGINEERING AND TECHNOLOGY TAXILA
(STRENGTHENING AND UP-GRADATION OF UNIVERSITY OF
ENGINEERING & TECHNOLOGY AND ITS SUB-CAMPUS)**

Phone: 92-51-9047633 Fax: 92-51-9047797

Tender Notice

1. The University of Engineering & Technology, Taxila invites bids for purchase of Laboratory Equipment on CIF and Pak rupees basis for Department of Environmental Engineering, Industrial Engineering, Electrical Engineering, Mechanical Engineering and Electronics & Mechatronics Engineering from authorized distributors / sales agents. The details of equipment including specifications are provided in the Tender document(s).
2. The Tender Document(s) can be purchased on Payment of Rs. 5000/- in Habib Bank, Branch UET Taxila on prescribed Challan Form.
3. Tender Document(s) can also be downloaded from official website of UET, Taxila (www.uettaxila.edu.pk) or can be obtained from the office address below. The Bidders may visit the office of Project Director (SAUG) during working hours of University.
4. The Bids (Technical & Financial) on single stage two envelope basis should reach the undersigned not later than **11:00 am on 03.02.2014**. The bids will be opened on same date at 12:00 noon in the presence of bidders.

Prof. Dr. Saeed Ahmad
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